AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Vol. XXXVIII
No. 14

NEW YORK, APRIL 4, 1918

Ten cents a copy
Three dollars a year

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MASTER TRUCKS

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And this increased business has brought with it an increased tax on transportation facilities, has made the motor truck an absolute essential in overland freight hauling.

The Master Truck is indeed the truck of a busy nation.

Master of the Load on ANY Road

This powerful truck is the result of successful co-ordination of superior units, backed by the engineering skill that comes from fifteen years of truck engineering and truck building experience.

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5-ton "B", $4690 6-ton Tractor "T", $2550

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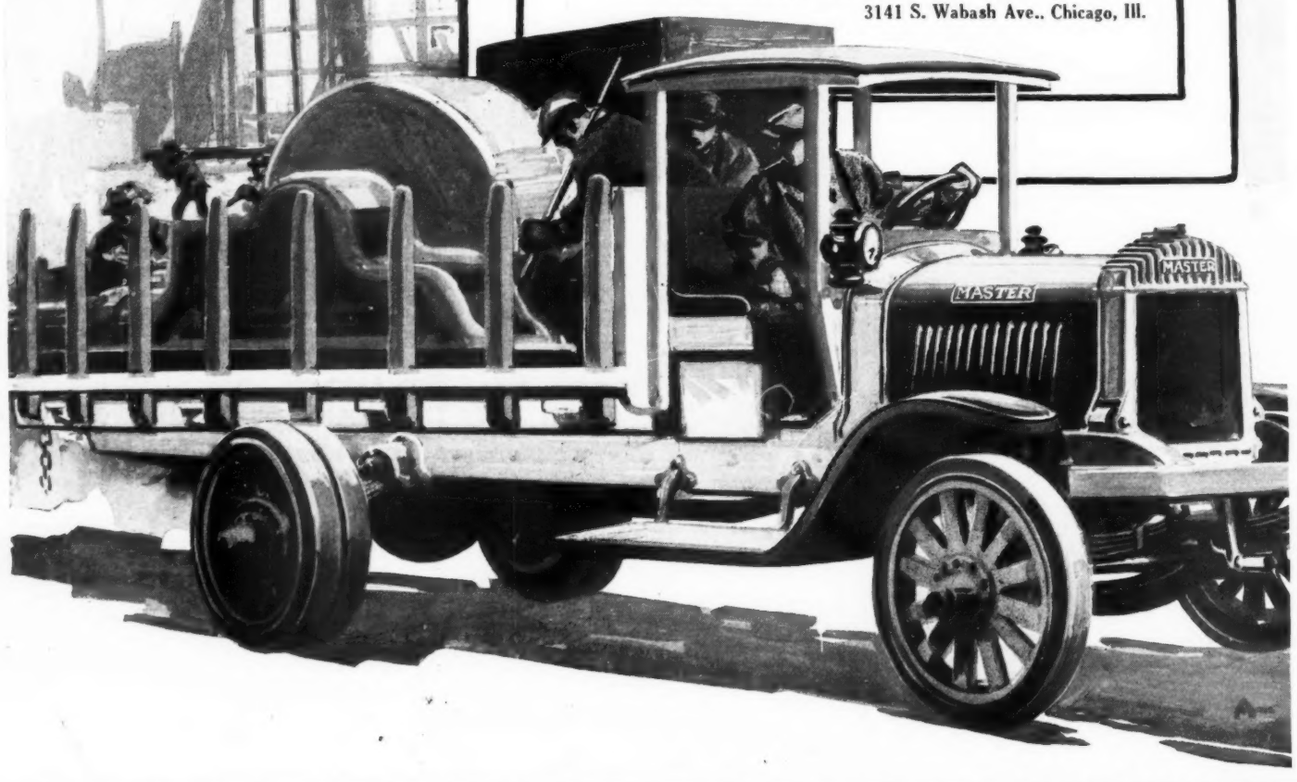


AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXVIII NEW YORK—THURSDAY, APRIL 4, 1918—CHICAGO NO. 14

Plan for Distributing Fordson Tractors

Farmers to Buy Direct and Sign Agreement to Use the Tractor Efficiently and Lend It to Others at Reasonable Cost

THE 1000 Fordson tractors which the Michigan War Preparedness Board will distribute to Michigan farmers are being sold direct to the farmers by the state at a uniform spot cash price of $750, f.o.b. Dearborn. Orders are being taken and tractors are being distributed by county agricultural agents and by chairmen of local War Preparedness Boards. These officials look also after the collection of the purchase price, which ultimately reaches Henry Ford & Son through the central War Preparedness Board at Lansing. The Oliver tractor plows which complete the equipment are being distributed through the local retail implement dealers at points of tractor distribution at a uniform spot cash price of $125 delivered.

Community Co-operation Required

An important feature of the plan, one which appealed strongly to both Mr. Ford and to Governor Sleeper, and one which inspired both to undertake the experiment, was the community co-operation idea. The form of order which the farmer signs for his tractor binds him to lend his tractor at a reasonable price for the benefit of his neighbors whenever he can spare it from his own needs.

This obligation which the farmer assumes is more moral than legal in its force, since it will be impossible to enforce it, but it will have force nevertheless. Compliance with it will be increased by the activities of the officials who have charge of the distribution of the tractors, since they will interest themselves to the extent of watching opportunity to keep the machines constantly in use. Without any doubt many more acres will feel the good effects of tractor tillage through this provision in the contract than would otherwise have been the case. Thus in a measure at least this ideal of community use will have been attained.

The new Oliver No. 7 tractor two-bottom gang plow was designed originally for use with the Ford tractor in England and Canada. As a matter of fact, several thousand of them have been shipped abroad and 1000 are going into Canada. Inasmuch as the Oliver company had no dealer organization to protect in England, and as all service responsibility ceased as soon as the plows were delivered to the transportation company at South Bend, Ind., the Oliver company made a price to the English government of $97.50, f.o.b. South Bend. The same price and terms applied to the Canadian consignment.

At the time when Henry Ford made his proposition to Governor Sleeper he had cognizance of the English and Canadian deals, and, without consultation with the Oliver Chilled Plow Works, he jumped to the conclusion that he could duplicate the deal. He so represented to Governor Sleeper, and the original proposition contemplated the coincident delivery of the tractor and plow at a uniform price of $850.

Mr. Ford was entirely unauthorized to make this price, and as soon as the terms of his joint proposition came to the attention of the Oliver Chilled Plow Works, Governor Sleeper was immediately advised that the company could not meet the conditions. This threatened for a time to stall the whole deal, but the Oliver company made a compromise proposition finally, which the governor accepted.

This was to the effect that the Oliver plows should not accompany the tractors from the Ford factory, but that they should be shipped from South Bend directly to retail implement dealers at the points where the tractors were to be distributed. According to the original sales plan on this special

plow worked out by the Oliver Chilled Plow Works it was to have been sold to the dealer at $125.

As a protection to their dealer organization in Michigan, where they have some 600 agents, the Oliver Chilled Plow Works insisted that no lower price would be considered or sanctioned. However, as a special concession in the Michigan deal and as a compromise proposition to the Governor, the company agreed that the price to the farmer on these 1000 plows might be the dealer price of $125, and a special discount of 12½ per cent would be given to the dealer and the freight allowed.

Payment on Delivery

Settlement in cash at the time of delivery was insisted upon by the company so that the dealer should incur no credit risk, and all responsibility for and expense of expert service was assumed by the company. This proposition was acceptable to the Governor, and the Oliver plows are now being delivered in accordance therewith.

The implement trade has been afforded few instances of more effective protection than this.

The Oliver No. 7 two-bottom gang plow is especially designed for use with the Fordson tractor. By the use of a heat-treated alloy steel the weight of the plow has been reduced 25 per cent below that of any engine gang of similar capacity on the market. It is also exceedingly simple in construction and easy of operation. The lifting device and the dēpth regulating feature are new and effective. By an arrangement of the plow levers these are brought within easy reach of the tractor operator, making the outfit strictly a one-man unit.

Several things lend interest and importance to the distribution of the tractors and engine plows.

Concentration of Productive Power

First perhaps comes the concentration of agricultural productive power. It has been proved conclusively that the use of a tractor in tillage operations increases materially the productive capacity of the farm. Of course, a thousand tractors put to work anywhere, collectively or individually, would have the same effect upon production, but where so many tractors are started almost simultaneously within a limited area the result is far more apparent than would be the case were the machines scattered. Michigan, heretofore, has not ranked as one of the principal tractor-using States. During the month of April, however, her quota of tractors in actual use will have been increased by a thousand, thus at once putting her into the front ranks and making the consequent increase in her agricultural production for this and subsequent years a factor of great importance.

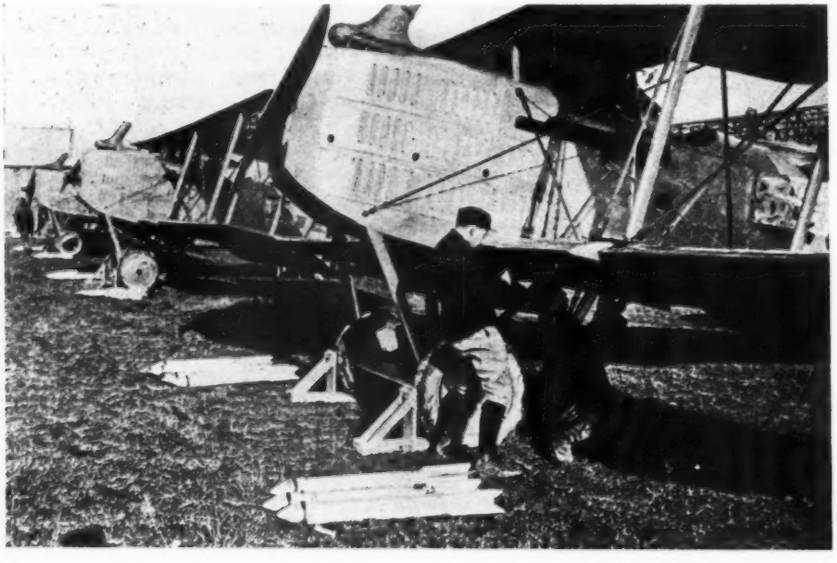
Second, under the stimulus of the enthusiasm engendered by an experiment of such magnitude these thousand tractors will reach more quickly the places where they can be used advantageously than would be the case were their acquisition left to the normal course of trade. Tractor ownership will have been speeded up, and farmers who should have tractors will be induced by the urge of the occasion to come to a buying decision, whereas otherwise they would have been more deliberate about it. Probably as many tractor sales will have been effected in one month as would have been effected in a year of normal buying. This also is of great importance.

Third comes the encouragement given to community use. Every farmer who buys one of these tractors signs an agreement to keep his tractor in use the greatest possible amount of time and to lend it at a reasonable price for use in the fields of his non-tractor-owning neighbors whenever it can be spared from his own fields. Such neighborly employment, to be sure, is entirely dependent upon the volition of the man who owns the tractor, since no steps have been taken, nor can any be taken, to enforce community use. It is likely the fact too that a majority of the purchasers will find they will have little time to devote to their neighbors this spring, since most of the machines will go onto farms where there will be use for them to the limit of their capacity during the spring plowing season. Nevertheless there doubtless will be numerous instances of neighborly assistance, and thus the idea of community use of farm power equipment will be fostered. This cannot fail to be an advantageous and important development.

National and State Co-operation

Fourth is the co-operation of national, state and individual effort for a common purpose. This comes about through the working together of county agricultural agents, directly connected with the United States Department of Agriculture, the chairmen of local War Preparedness Boards, reporting to the State War Preparedness Board at Lansing, and the local retail implement dealers at points of distribution. The county agents and the local chairmen secure the orders for tractors from the farmers, make up the carload shipping directions and attend to the delivery of the tractors and the collection of the purchase price.

Collectively the distribution of tractors and plows in Michigan is the biggest thing of the kind ever undertaken in the history of American agriculture and has a significance and importance tremendous in its import. It has furnished the occasion for manufacturing industry, national and state officials and individual interests to demonstrate their patriotic impulses with a spontaneity and with a singleness of purpose never before witnessed. It furnished the opportunity for a manufacturing wizard to put his genius for factory organization and production at the service of his country at a time of imminent emergency.



Loading Airplanes With Bombs

This view, taken somewhere in France, shows part of a French bombardment squadron preparatory to a raid on enemy positions. The planes are being loaded with bombs, some of which may be seen beside the machines on the ground

Aviation Situation Little Changed

Need for Greater Publicity to Educate the Public—England and France Order Liberty Engines

WASHINGTON, April 3—There has been little change in the aviation situation within the last week with the possible exception of a trend toward a more conservative and rational view of the aviation program. In some quarters good publicity is being given to German propaganda, which has been holding back airplane production in many factories and which heretofore has been covered up too much. Pitiless publicity exposing every pro-German act in connection with the airplane program must be had.

Washington is realizing more and more that too great secrecy has surrounded airplane work, and although no one wishes to give military secrets to enemies it is a fact that literally volumes could have been written in the last 10 months on airplane activities, which would have educated the country to the real airplane problems. Had such education been carried on the public would have been in a better position to judge statements with regard to the program.

As it is, millions of the public are to-day utterly incapable of passing rational judgment on airplane rumors or statements concerning airplane delay. The result is that the wildest rumors are passed on with apparent approval by thousands of people who should know better, but unfortunately do not. These people are scarcely to be blamed for their ignorance, because Washington has held the lid down on the aviation program.

It would have been immeasureably better many weeks ago if photographs had been distributed throughout the country showing the Liberty engine after making its cross-country flights from Dayton to Detroit or other places. These photographs and the story of how long it took to make the flight, and the performance of the engine, would have been good material for 40,000 of our population. Had such publicity been given out there would have been millions ready to nail many of the infamous rumors concerning the engine, and this very situation would have stamped out much German propaganda and had a dampening effect on those responsible for it.

Authentic Information Scarce

So little authentic information has been given out concerning our airplane program that very few have any comprehensive conception of what has actually been accomplished. Hundreds of photographs of flying on our Southern fields could have been published. There can be no possibility of betraying military secrets by such publicity. Photographs of hangars at different flying fields would have had an educational effect even if these photographs would not have the desired completeness.

An example of further publicity is McCook Field, Dayton, Ohio, which is the government experimental station for aviation. This field has hundreds of civilian employees who go to and fro with the utmost freedom, and there is no effort made to control these workers in the sense of restricting anything they may say regarding the work being carried on. Any pro-German would not have any difficulty getting employment and many so-called military secrets. Many photographs of this field might have been published and circulated very generously. There would have been much stimulation connected with these photographs, even if the arrangements in the field are not near completion or as perfect as desired.

Great Britain has found it desirable to make a special propaganda on certain matters connected with her aviation work. Special stories have gone out concerning wind tunnels and other equipment being used, which show how thoroughly and scientifically she is going into the work. To the general public such information means much, but the Germans, who are desirous of obtaining military secrets, can receive little from such stories, as they know that any nation should have wind tunnels and other experimental apparatus for the good development of its aircraft.

No greater safety factor or safety control valve that would work for the benefit of our aviation program could be conceived than that of rational legitimate publicity. Such publicity is needed. There will be some criticisms, but they will generally be just and in the end they will prove constructive rather than destructive.

Liberty Engines Going Abroad

Senator Reed stated in the Senate yesterday that England has ordered speedy delivery of 3000 Liberty engines, Italy 3000 or more and France also a large quantity. The Senator used these figures in conjunction with a statement that the English, French and Italian aeronautical experts had carefully investigated the Liberty engine and found it sufficiently worthy to place these large orders. Discussing the recent controversy of the merits of the engine, the Senator stated:

"The Liberty engine is not a failure. I talked yesterday with the expert the British government has sent here, the man whose business it has been for nearly three years to create the engines for the air service of England. I saw the cable in which English governmental officers are insisting upon the speediest delivery to them of 3000 engines. Now will any man claim that the British government with its expert on the ground, and perhaps the greatest expert in the world, is insistent upon having 3000 worthless engines?

"The French government, according to the best information I have, has ordered a large number of these motors. The Italian government, I am informed, has ordered a large number, 3000 or more. These governments are not ordering a worthless machine. They know a good machine. They have tried this question out upon the battlefield in actual contest. The answer I make to all these criticisms is this:

"Although we may have met with some disappointments, it is not fair, it is not right to say the Liberty engine is a failure. Senators are sometimes misled, as are other people. The question is raised whether we have an engine which is employed in the type of machine that is to be used only by a few great expert fliers and fighters. It is probably true that the British have one type of machine which is made almost entirely by hand and which can only be made slowly that is su-

(*Continued on page* 709)

Automobile Trade in Japan

Motor Car Business Increasing—Body Work Largely Done by Hand—Field Worth Cultivation

By Tom O. Jones*
Commercial Agent Bureau of Foreign and Domestic Commerce

WASHINGTON, April 2—Japan in 1917 purchased twice as many motor cars as ever before in her history. Previous to last year, 1913 was the biggest season the kingdom had ever known in the importation of motor cars, and although the figures and the total number of cars imported that year are not available, their value was $605,016.

These figures were practically equalled during the first seven months, when 344 cars totalling in value $597,632 were imported. While total figures for 1917 are not yet available in America, the importations recorded up to September 30 were 572 cars valued at $1,025,890, so that the importations in Japan for last year doubtless reached 700 cars worth over $1,250,000 at their landed price.

From these figures it can be clearly seen that Japan is advancing in her use of motor cars. The market is not big considered from the standpoint of American business, for there are any number of cities in the United States which distribute even a greater number of cars than go to Japan during the year, and in fact there are numbers of dealers in the United States with much smaller territory considered from the basis of the population who put out a greater number of cars of one make. But from the standpoint of Japan, the business is increasing. At the present time there are practically 2700 cars in Japan. Six years ago 300 cars would have been a very liberal estimate for the entire kingdom.

During 1914-15, the first two years of the world-war, automobile importations to Japan slumped considerably. In 1916 nearly seven times as many cars were brought in as in the previous year, while 1917 figures will show at least three times as many as in 1916.

The advance in the last two years can readily be put down to the financial conditions in Japan. Profits on war contracts and shipbuilding and shipping have been large. Men who never before were able to consider the purchase of a motor car have now found the way open to have not only one car but many more if they so desire.

The American manufacturer has, of course, had practically a monopoly in Japan in the past few years. He finds it a good market because little change is required in making his chassis suitable for the field. For instance, while the Japanese road rules require driving to the left, just the opposite of ours, and right-side drive is preferred, there is no arbitrary demand for right-side drive. Furthermore, battery ignition is meeting with favor and the absolute demand for magneto has practically disappeared.

Must Furnish Chassis and Cars

The American companies who have done the best business in Japan are those who are prepared to furnish chassis as well as complete cars. The demand in Japan is largely for a closed car of the limousine type. Facilities for building bodies of this kind are part of the plant facilities of practically all of the larger dealers, the

**Editor's Note.—Mr. Jones was formerly with the J. B. Crockett Co., New York, and was given a special appointment by the Bureau of Foreign and Domestic Commerce to investigate automobile conditions in the Philippines, Hawaii, Japan and China. The following is a preliminary report of Japanese conditions. The complete report will be published in several weeks by the Department of Commerce.*

Japanese workmen using the adz in forming certain parts of enclosed bodies in a native body-building plant

General view of a Japanese body-building plant, showing enclosed body work in various stages of construction

greater share of them being maintained on lines of six-cylinder chassis. They are all-wood bodies and very presentable, although the tools with which they are fashioned would look very crude in the American body plan.

As a general thing the high-priced American cars are too big to be considered suitable for the Japanese market. It must be borne in mind that while Tokyo, Osaka, Yokohama and Kobe have some wide streets, the great majority of the roadways are very narrow, making it difficult to handle a long-wheel-based car at the intersection of these narrow streets. This is true also in the country, where the roads, although well surfaced, are narrow and have many sharp turns.

Tokyo, the capital, is the motoring center, practically 50 per cent of the cars in the kingdom being used in that city, and the American manufacturer to do the maximum business in Japan should endeavor to secure as his distributer the Tokyo house that will maintain branches or make dealer connections in Yokohama, Osaka, Kobe and either Shimonoseki or Moji.

Leaving out of consideration the narrow, crowded road conditions, there are many incentives for touring Japan in the way of scenery and points of interest.

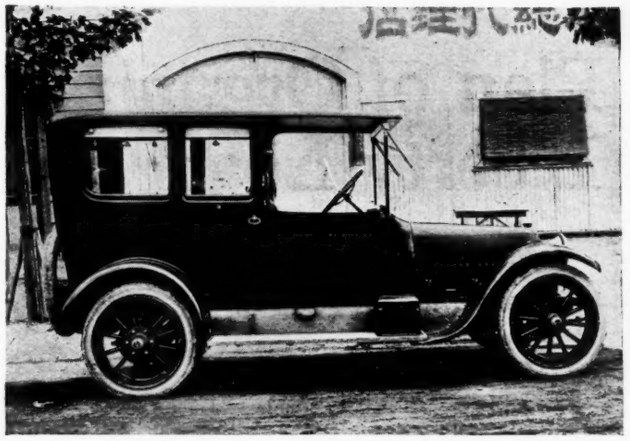
Roads Being Rapidly Improved

One point which will tend materially to assist in the development of the automobile trade in the kingdom is the progress being made on the roads. Up to the present time this advance has practically been in the hands of the military department, roads being built in many sections, chiefly the mountainous districts, to take care of the military transport by motor truck. The governments of Tokyo and Yokohama have worked together on the project of highway between the two cities, widening the present route considerably at a cost of approximately $1,500,000. The building of a new road suitable for motor vehicles between Kobe and Osaka is also definitely decided upon. There is a huge amount of traffic between these cities and the use of both pleasure and commercial vehicles will be developed by the opening of these routes.

Lacks Good-Roads Organization

In one thing Japan is lacking, there is no organization at the present time which has as its object the betterment of road conditions. The only automobile club in the country is not in position financially to carry on this work.

Roughly, the selling price of any American car in Japan can be put down as approximately 100 per cent greater than the list price in America, due to the high shipping and insurance rates and the 35 per cent duty on landed cost. The operating expense is but little higher than in America, despite the fact that tires are considerably more expensive, and gasoline has for several years past cost in the neighborhood of 45 cents per gallon. Taxation rates are low, from $5 to $10 per year per car.



Typical view of enclosed body which is most popular with purchasers in Japan

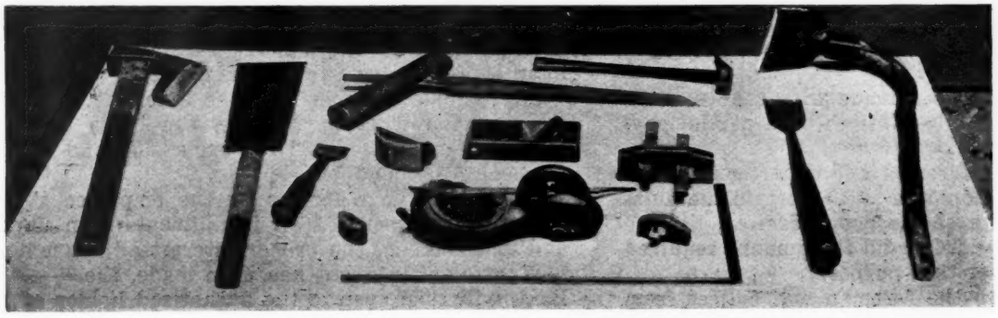
Up to the present time Japan has built practically no cars of her own. There are several companies in the kingdom that are just now considering the advisability of entering this field and are doing their preliminary work, but it will be several years before any of them can get on a real production basis.

The best medium for advertising in Japan is the daily newspaper. Many of those in the larger cities have circulations which compare favorably with the American dailies, although the publications are by no means as pretentious as ours.

Importing Motor Trucks

Up to 1917 practically no use was made of the motor truck in Japan, except by the War and Post Office Departments, but during the past year practically each of the larger dealers has taken on a line of American trucks and ordered sample cars, and it is known that these shipments going forward in the latter part of 1917 have already resulted in repeated orders in fairly large quantities, but with the low cost of labor and the present method of hauling by coolies or single horse wagons as an influence against the motor truck it will take considerable time to break down prejudice in order to have these figure to any great extent in the ordinary commercial field.

While the business in Japan, again considered from the American standpoint, will never be huge, it is well worthy of the attention of the American manufacturer, but the territory can be developed with profit only with a class of dealers that are financed and maintain establishments such as to give American cars worthy representation.



These are the principal tools used by Japanese workmen in producing automobile bodies

Plan of Organization for Liberty Loan Campaign

Detailed Instructions on Soliciting Subscriptions and Recording Installment Payments

A cartoon something like this one might be prepared and placed in conspicuous places around the plant. It would help in the "Lick the Kaiser" campaign

THERE is still time to put more force into your Liberty Loan campaign. If you have followed the suggestions in the last two issues of AUTOMOTIVE INDUSTRIES, or some similar plan of operation, you now have a well-organized team at work. You can stiffen the back-bone of this organization and at the same time finish the drive with a whirlwind climax which will bring results if you concentrate on this work in the proper way.

Get out a special "Lick the Kaiser" campaign. Bring out a special number of your daily bulletin to handle the work for you. Use a good cartoonist and fill your factory with some good vigorous samples of his work. The variety of subjects is infinite and, being graphic, they work well.

Men who have not contributed to the loan in the first week of the drive will have to be hit squarely between the eyes with strong posters, vigorous bulletins, and strong talk, which will bring home to each and every man the personal message necessary to make him feel himself a part of this war.

One of the greatest obstacles to be overcome is the semi-pro-German. He does not want to see America beaten, but his daily sing-song, whenever he musters up the courage to speak at all, is that, "We have no business to be in this war." Let him ask himself if the Germans will inquire closely into his personal feelings if they ever get over here. What he pays for his Liberty bond he gets back with interest. What he would have to pay as his share of a war indemnity would never come back, with or without interest, and would have to be paid whether he approved of the sinking of the *Lusitania*, or the freedom of the seas or not. All this makes excellent subject matter for graphic drawings or sentences.

In talking to the workmen of the plant one of the most true and effective means of bringing their personal debt home to them is to point out how much their brothers who have already joined the expeditionary forces depend upon them for support. Out of every plant in the country some of the men have gone. There is scarcely a workman in the shop to whom at least some of these men were not known by their first names. They are receiving letters from them telling of their life on the other side, and soon letters of real battles and dangerous engagements will be coming back. The appeal to stand behind these men will prove irresistible to every red-blooded man in the plant.

There will have to be a systematic method of checking the returns of the bonds sold on the partial payment plan. The banks assisted in this in the second loan and the method used by many of them can be used by plants on the third loan. A suggested method is given herewith:

How to Subscribe to the Third Liberty Loan

Interest at 4¼ Per Cent

"To All Employees:

"a—Employees of the company who desire to purchase any of the Third Liberty Loan 4¼ Per Cent Government Bonds will be given an opportunity to do so within the next few days.

"b—Arrangements have been made with the ———— Bank to handle these subscriptions on a partial payment plan.

"c—At the proper time foremen and department heads will interview each employee and ascertain the number and denomination of the bonds desired, list the roll number, name, address and the amount required on sheets provided for that purpose.

"d—The next day or so the foreman will collect from the employee the first payment of 2 per cent on each bond, obtain the workman's signature on the bank cards and at the same time post the amount of the first payment in the Liberty Loan pass book, and hand this pass back to the employee.

"e—Payments will be made at the Liberty Loan booth the day following payday, on the basis of semi-monthly payments at $2 for each $50 bond and $4 for each $100 bond, etc.

"f—Bonds may be taken up by the employee at any time upon payment of all installments then unpaid and upon making the proper interest adjustments.

"g—When final payment has been made, the ———— Bank will turn over to the authorized holder of the

Packard Motor Car Company

EMPLOYES SUBSCRIPTIONS

TO

Second Liberty Loan

Taken by _____ Date _____

Dept. _____

Sheets Sheet No.

	Serial No.	Dept.	Roll No.	NAME	ADDRESS	Amt. of Subscription	Denomination desired	Amt. of First Payment	Date Paid

Record sheet listing the subscriptions of employees to the Liberty Loan

PACKARD MOTOR CAR COMPANY
SECOND LIBERTY LOAN

Amount _____

Denominations _____

Name _____ Roll No. _____

Address _____

Signature _____

Date	Amt. of Payment	Total Paid	Date	Amt. of Payment	Total Paid

Record blank for detailing the payment of installments on loan

pass book a United States Government 4¼ Per Cent Bond, making an adjustment of accrued interest.

"h—In the case of any employee who leaves the service of the company or dies, or fails for any reason to pay any installments when due, the ——— Bank will sell at the then prevailing market price the bond or bonds for which the employee has subscribed, and will pay over to such employee, or in the case of death to his or her legal representatives, the balance remaining after deducting from the amount received from the sale the full amount of the unpaid installments with interest adjustment.

"i—This plan does not prevent any employee from subscribing directly to the Third Liberty Loan through banks or otherwise.

"j—Bonds are in denominations of $50, $100, $500, etc., interest payable May 15 and Nov. 15."

Methods of Conducting Third Liberty Loan

1—The duty of canvassing the department will be in the hands of the foreman of the department and such assistants as he may appoint.

2—At the proper time he will interview each employee.

3—He will write on a sheet provided for the purpose, the roll number, name, address, amount subscribed for, and the denomination of the bond. If subscriber desires to make payment at that time, receipt for the amount paid will be given.

4—At the same time, the assistant who helps the foreman in this work will obtain the workman's signature on two bank cards.

5—When the canvass is complete the foreman will turn the list, bank cards and the money over to the Liberty Loan Committee, waiting until the amount of money has been verified with the list and accept receipt for same.

6—From this list an employee's Liberty Loan pass book will be issued. If the first payment has been made the amount will be posted in the pass book and on the company's copy of the bank card. Pass book will then be taken to the department and be handed to the workman in exchange for his original receipts.

7—If no payment has been made, the list together with the pass book will be taken to the department where the first payment will be collected and recorded on the list and in the employee's pass book.

8—When all collections have been made, the list together with the money will again be turned over to the Liberty Loan Committee and a receipt given.

9—From the company's copy of the cards, a statement by individuals will then be made of the money collected, and this, together with the money and the bank's copy of the card, will be forwarded to the Main Office of the ——— Bank.

Instructions to Foremen

1—The duty of canvassing the department will be in the hands of the foreman of the department and such assistants as he may appoint, working in co-operation with a general soliciting committee.

2—The foreman of each department will be provided with a large envelope containing subscription sheets, bank cards and receipt blanks. At the proper time he will interview each employee. Call Mr. ——— for additional copies of forms.

3—He will write on the subscription sheet the department and roll number, name, address, amount subscribed for and the denomination of the bonds. If subscriber desires to make payment at the time, receipt for the amount paid will be given and the amount and date paid noted on the subscription sheet. All checks should be made payable to the ——— Bank.

4—At the same time, the assistant who helps the foreman with this work will obtain the subscriber's signature in ink on the bank card, in the space marked *signature*.

5—When the canvass is complete the foreman will turn the list, bank cards and the money over to the Liberty Loan Committee in the Employees' Welfare Office, waiting until the amount of money has been verified with the list and accept receipt for same.

6—From this list the employee's name, roll number, address, amount subscribed and the denomination of the bonds will be typed on three cards—one for the bank, one for the Liberty Loan Booth and one for the employee.

7—When the amount of the first payment has been recorded on the employee's card it will be placed in the pass book envelope and sent out to the department to be delivered to the subscriber in exchange for his receipt.

THIRD LIBERTY LOAN RECEIPT

Date _____

Received of _____

Amount _____ Dollars, as first payment on

Third Liberty Loan Bonds

Signed _____ Roll No. _____

Name

Receipt for payment of money on Third Liberty Loan

War Truck Driver Qualifications

Passenger Automobile Experience Not Enough—Military Training Essential—French Drivers Superior

By W. F. Bradley

Special Representative of AUTOMOTIVE INDUSTRIES *in France*

PARIS, March 1.—The automobile having been perfected to such an extent that the driving of it is quite an easy matter and one well within the capability of any intelligent man or woman, there is a general impression that no care need be exercised in the selection of men or officers for truck convoys or staff car work. Every nation has made the mistake of underrating the technical knowledge required to handle automobiles under war conditions. Even America, possessing a greater portion of automobile drivers than any other nation, and having no necessity to draft her old or unsuitable classes, is in danger of making the same mistake as France, England, Italy and Belgium. Because of lack of organization America is at present inferior to these nations in so far as her army automobile service is concerned.

Classes of Driving Pupils

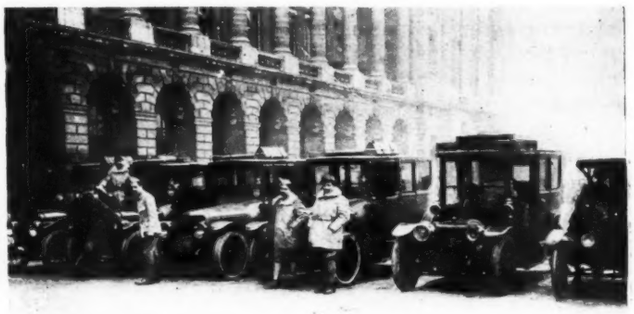
European government officials, whose only experience of automobiles has been to ride on the rear seat of a limousine, have decided that the work of driving a car is so easy that no young man should be allowed to perform it, no matter what his previous experience. In France the practice has been to ignore peace time training and accept for the motor transport service only men who have been wounded and are unfit for further service in the trenches, or men of not less than 38 years of age. The young men, if they are under 30 years of age, can generally be made into good drivers if subjected to a systematic course of training extending over three or four months. The older men, being mostly agricultural laborers, have not the faintest notion of the anatomy of an automobile and, not being very receptive, are difficult to train. The most unsuitable pupils of all, however, are the clerical classes of more than forty years of age, men who have had no road experience of any kind and are ignorant of the elements of mechanics. The farm laborer has driven a horse and can judge distances and understands in a vague sort of way the extra effort required to mount a hill. The lawyer or lawyer's clerk does not possess this intuition.

Two Weeks' Training Proves Insufficient

When the call was urgent, the French army put numbers of drivers into the field after only two weeks' experience of automobiles. The immediate result was deplorable, and although these men under properly trained officers eventually became good drivers, they destroyed thousands of dollars worth of machinery in the meantime. It would certainly have been more economical to the nation to have taken experienced men out of the actual fighting units and put them in the motor transport service rather than train raw recruits. After 3 years the desired result has been obtained and with the carefully elaborated machinery now in existence it is possible to put a farm hand into the school and after a time turn him out suitable for active service in the field.

Motor transport men assist in placing a gun in position

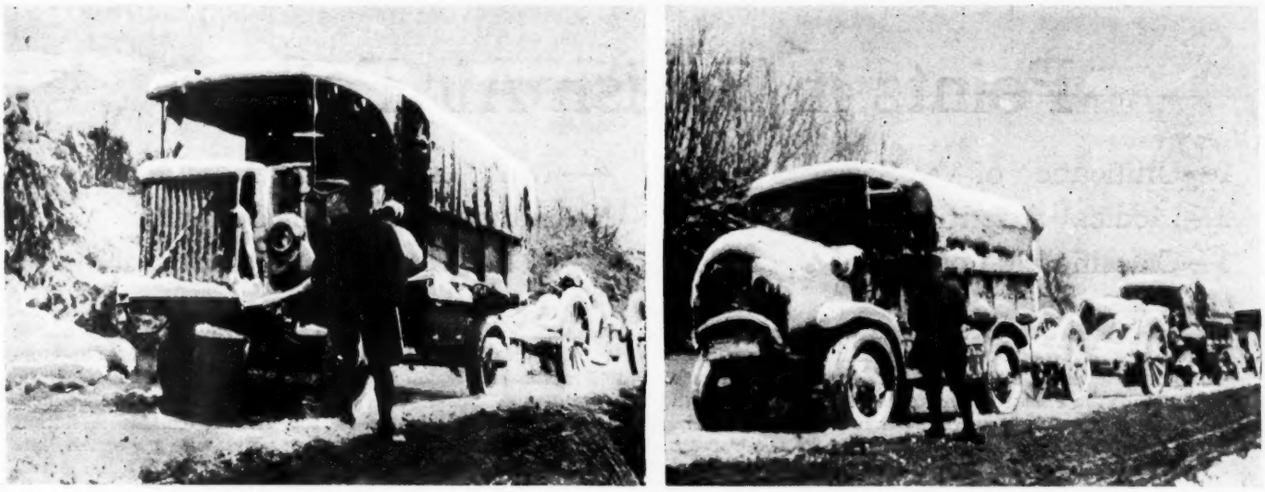
The notion that the only requirement of an army motor driver is the negative one of low physical ability is disastrous to the service. Another equally false notion is that any man having had a year's private experience as automobile driver is fit to go into military automobile service without further instruction. An infantryman entrusted with a rifle and a kit not worth much more than $100 is carefully trained in the use of those articles so as to get the most efficient service out of them. Men of every Allied army, including the American, have been entrusted with automobiles worth in each case from $1,000 to $4,000, without having received 5 min. instruction in the handling of those particular machines, and without having been drilled in the highly specialized practice of maintaining automobiles in the field. The initial mistake has been made by highly placed non-technical officials who possess the mad notion that automobile driving is an agreeable pastime. From the purely military standpoint it may be economy to weed all the hefty young fellows out of the automobile service; but viewed from the point of dollars and cents it is a huge mistake to suppose that the automobile service is a non-technical as well as a non-combatant branch.



Staff cars outside the Allied War Council in Paris

Lack Sense of Personal Responsibility

Although American conditions are quite different from those of Europe, it is a mistake to suppose that we have nothing to learn from the automobile services of the British, French, Italian and Belgian armies. Such a big proportion of young American men have had driving experience that it is assumed every candidate who comes along is fit to go into the field with a car or a convoy. This is untrue. The young American is first-class raw material and can in a short time be made into the finest automobile driver in the world. His good qualities are, at the outset, his most serious defects.



A four-wheel driver (Jeffery Quad) out in the cold on the French front

He has plenty of dash and vim: he is determined to get there, and in his determination he quite overlooks the fact that cost is as important a factor in military as in civil life. Generally the young American driver has no sense of personal responsibility. If he smashes a car, or if he ruins one by his neglect, that is an accident of war and he expects to be given another machine without question. He has not heard that in all European armies it is a case for court martial, with probably a transfer to the front line trenches, where destructive methods can be applied to some advantage.

Special Training Necessary

Private car experience does not necessarily fit a man for military automobile service. Here are a few experiences: A big driveaway was organized from one of the Italian factories, the distance to be covered being about 900 miles. The first stage of that trip comprised the crossing of the Alps at a height of more than 7000 ft., there being a twenty-mile climb on the Italian side and an equal descent on the French side. For this portion of the journey, by far the most difficult, professional testers used to convoy formation and well acquainted with the roads were engaged. The trip was made at an average speed of 30 m.p.h.; the time schedule was adhered to within the limits of less than 5 min. throughout the trip; there was not a scratch on any one of the cars, and although there were a few roadside stops the experience of the men was so great and the general arrangements so good that the entire convoy came through with much greater regularity than the train.

At the end of the first stage the professional testers were sent back and their places taken by young Americans, all of whom had had some experience as Ford ambulance drivers on the front, many of whom were college men, and all of them of superior intelligence. They had relied on their nerve and had done very good work at the front; but they were all devoid of military automobile training and all very defective in mechanical knowledge.

The change was complete and instantaneous. The average speed dropped 40 per cent; there were always delays in getting away in the morning; there were frequent waits by the roadside for stragglers to come in; the driveaway was finished with 10 per cent of the radiators or fenders damaged; two clutches were ruined by inexperienced handling; one driver, until discovered by the officer, changed gears without withdrawing the clutch; he had had 4 years' driving experience on a Ford. Another man did not know how to change a detachable wheel; he was discovered by the roadside trying to get the brake shoe off; 50 per cent of the windscreens were broken; men were held up with choked gasoline lines and did not know how to clear them; one car went into the ditch owing to reckless driving; another man asked for mechanical assistance to tighten up nuts which had worked loose.

A second and quite recent experience is very similar: Twenty-five new ambulances left the factory for a driveaway of 300 miles to the front. Seventeen gasoline tanks were punctured on the way; one car broke down completely owing to bad handling and had to be left by the roadside; three radiators were stove in. The drivers were all young Americans who had plenty of individual experience on Fords, but had never before been in convoy formation. Another army unit, supplied with first class European cars, had 40 per cent of their cars out of use after 5 months' service, while the town from which they operated bore traces of their labors in the number of lamp posts knocked down and civilians injured.

The various European armies experienced trouble in the early days by reason of collisions. In consequence elaborate bumpers were fitted both front and rear; there is no bumper designed, however, which will give adequate protection against reckless or careless drivers. Most of the European forces have learned that the only remedy is in proper training and control of drivers, the rôle of the bumper being to provide against accidental collisions of a very light nature when manouvering in yards and particularly against overhanging loads encountered when driving in the dark at night.

The only method of securing an efficient driving staff is to select only men who have had previous experience as drivers and to put them through a military course. A professional driver who has had 10 years' experience on the road need not stay many days, but even he needs instruction in convoy driving, in the special rules to be observed on the road, in the loading and unloading of trucks, towing, first aid to broken down vehicles, etc. The average young man who has owned or driven a car for a few months thinks he knows it all; and unfortunately, too, many high officials are of the same opinion. The fact that some American groups of untrained military drivers have not more than 60 per cent of their cars in service at any time, while veteran military-trained French groups do not have more than 5 per cent off the road, is proof of this. Individually the Frenchmen are no better than, if indeed they are as good as, the Americans; but the former have had specialized training and the latter have had none.

Technical Instruction to Officers

More important than the training of drivers is the special technical instruction to officers. Both the British and the French maintain technical schools for the training of motor transport officers. The course covers automobile engineering, map reading, loading problems; practical repair work, fitting, etc.; the cadets have to drive single cars and convoys under day and night conditions, the more experienced of their numbers taking charge of the convoy. They are given instructions to reach a certain point, unknown in advance, and are expected to load up, take the necessary amount of fuel with an excess not to exceed 15 per cent, and to reach the appointed place and unload within a limited time. Such journeys have to be made under night conditions, without

(*Continued on page* 709)

Points in British Air Policy

1—Unification of the Services
2—Medical Attention to Air Pilots
3—Classification of Aerial Operations
4—Types of Machines Required
5—Standardization of Output
6—Aerial Reprisals Against Enemy

AN important debate took place in the House of Commons on February 21, when the Air Force Estimates were under consideration. The term "important" is used here because of the rôle the air forces are playing in the great war and the absolute necessity that everything having to do with the training and the equipment of these forces should have the fullest consideration. However, this importance was not reflected by the attendance during the session which, according to one speaker, varied from 5 to 25. He complained bitterly of this lack of a sense of responsibility.

The Air Council

Since the passing of the Air Force Act some time ago, which provided for the establishment of an Air Council having control of both the Royal Flying Corps and the Royal Naval Air Service, an interdepartmental committee under the chairmanship of General Smuts has thoroughly looked over the ground and the organization of the new department or ministry has proceeded apace. The central branch (or secretariat), the finance branch and the statistics branch are already in working order and a works and buildings department has also been organized and arrangements have been made whereby the director-general of lands for the War Office and the Ministry of Munitions is to act in a similar capacity to the Air Ministry.

By Feb. 1 the Air Ministry had been organized to the point where it was possible for it to enter into conferences with the War Office and the Admiralty concerning the details of the transfer of the flying branches of the army and navy. It was agreed that this transfer should take place gradually.

Co-operation Between the Services

The above facts were given in a report by Major Baird, Under Secretary of State to the Air Ministry. Major Baird also explained the plan of co-operation with the War Office and Admiralty, which is as follows: The Admiralty and the War Office respectively submit their requirements to the Air Ministry for aircraft. The Air Staff examines these requirements, and either agrees, disagrees, or modifies, as the case may be, and decides, subject to War Office or Admiralty agreement.

A conference is held weekly to discuss these points between the staffs of the Admiralty, the War Office and the Air Ministry, and the question whether a particular Air Force should be under the army or the navy for administration and operations is discussed, and recommendations are made at this meeting. The Air Council also has the power of laying down and recommending to the War Cabinet certain aerial operations, such as bombing, and the best means of carrying out those operations are discussed, and whether the army should carry them out or the navy should carry them out. The machines are specifically ear-marked for these operations, and organized for this work. That is briefly the essential distribution of work among members of the Air Council.

Medical Service for Air Force

A special committee under the chairmanship of Sir Watson Cheyne has drawn up a plan for a medical service for the joint air forces. It has been found absolutely necessary that the medical officers responsible for the care of the officers and men serving in the air should specialize in that particular branch of medical science, and that they should not be shifted indiscriminately from one place to another. The medical affairs of the Air Force are to be controlled by a committee responsible to the Air Council, composed of the Director-General of the Naval Service, the Director-General of the Army Medical Service, the Vice-President of the Air Council, a Medical Administrator of the Air Force, an Assistant Medical Administrator, one neurologist, one physician, one surgeon, one physiologist, and the Secretary of the Medical Research Committee. The Assistant Medical Administrator will act as Secretary.

Mr. Joynson-Hicks referred to the suggestion to establish a special medical service for the air forces and said that there had been an accumulation of machinery between the Air Board and the army, which it would be well to wipe out altogether. There were training detachments in the country, he said, where there are some 700 or 800 men under training who not only have no medical men attached to them, but whose flying field was not even in telephonic communication with a medical man. No advantage would be served if the House were told the total number of fatal accidents last year, but it was very great. Reference was made to purely training accidents, not accidents in France, and it was suggested that the system of training be revised.

Losses in Training

In January there appeared an interesting article in the British Medical Journal by Dr. Graeme Anderson, covering his own investigation of accidents, he having been for 3 years a medical officer in the Royal Naval Air Service. During a period of 6 months there were fifty-eight accidents, complete crashes, all of which were fatal to the airplanes themselves. Each of these crashes meant a loss of $7,500 to $10,000 to the country. Out of forty-two cases, thirty-eight were due to errors in landing, which was merely another name for insufficient training and practice.

Previous to the war these accidents were generally attributed to faults in the planes. In those days the men had more time to train, and the accidents gradually grew fewer in number. But during the war the number of accidents had increased again, and were likely to continue to increase because, instead of training on the older and lower powered types of airplane, as they formerly did, the men were now bound to train with a quicker and newer type of machine.

Causes of Air-Sickness

Following is part of an address by Sir Watson Cheyne:

"The two chief conditions which concern us, so far as we know at present, are the atmospheric pressure and the density of the air—the density of the air especially, because with a suitable density of the air there is the amount of oxygen available, and without oxygen we cannot live.

"In climbing a mountain 10,000 ft. high you take a day or two to do it, and in that time there is a certain amount of accommodation, and as, I suppose all mountaineers know, people get sometimes mountain sickness or mountain faintness, and many people are very glad to come down. But the conditions in aviation are quite different. You go up 10,000 ft. in a few minutes, and the human mechanism has not time to adapt itself, especially if you go still higher. After the aviator has mounted some distance he comes into air which does not contain so much oxygen as is necessary. He does not take in enough oxygen in one breath to meet the demands of the body, with the result that he begins to breathe faster. That does not suffice and the heart beats quicker to enable more oxygen to be taken in, and so you have a vicious circle

established, until the aviator gets to a considerable height, when the heart begins to fail; he begins to lose consciousness; he may actually faint, and, although that is not always fatal, because in these modern machines there is a considerable amount of steadiness, I am afraid a good many people never recover from that faintness.

"Nowadays, of course, aviators are provided with oxygen for inhalation when they find it necessary to employ it. Aviators differ very much in the heights they can go without the supply of oxygen.

"The heart and lungs are not the only things concerned. Almost more important is the nervous system. On the earth it is customary to take things quietly. The nervous system is not subjected to sudden and violent shocks, but up in the air the nervous system is acting, quite unconsciously to the individual, of course, under great strain. The nervous mechanism is acting under great strain in maintaining the equilibrium of the aviator, and it is acting under great strain in many other ways. I do not know that any aviators are consciously frightened, but their nervous system is frightened, if you understand what I mean.

"The great John Hunter, who lived in the eighteenth century, spoke of the consciousness of the tissues. For instance, if a bone is broken and improperly set, the tissues build up a bridge to strengthen the part, and he speaks of that as a consciousness of the tissues, and, although the aviator is not having any feeling of fear, the brain is conscious of the dangers surrounding him and is getting exhausted in its efforts to overcome those dangers, and where the exhaustion comes specially in is in a rapid descent from a high altitude.

True Binocular Vision Necessary

"Another important thing is the necessity of having true binocular vision, especially when traveling at a great speed, and of having a very rapid connection between the sight and the action; in fact, in selecting pilots, one of the most important points to ascertain is whether the binocular vision is good, and also the time it takes between the aviator seeing and taking action. Very often it has been discovered that one eye is not used at all. Many people are going about with one eye and are not using the binocular vision; that is an extremely dangerous thing. You could not allow a man to enter the Air Service unless you found he had proper binocular vision; otherwise he would kill himself and smash his machine.

"That is a very short sketch of the points that occur to anyone who is studying the medical aspects of aviation. The question arises: How are you going to avoid these dangers?

"For research the first thing is to find out the cause of all these troubles—the exact cause. For such research you want physiologists of high standing and you want physicians.

"The next thing chiefly concerns the prevention of those accidents, and, of course, the first form of prevention is to keep out pilots who are likely to be subject to those troubles—for instance, men who have not proper binocular vision, men whose heart and lungs do not allow them to go to great heights, and men in whose case the movement between sight and action is slow. Here, again, you need skill and special medical officers to make this examination.

Cumulative Effect of High Altitudes

"The medical man must be in constant association with the aviator. There is a cumulative effect of high flying on the aviator. A man goes up the first day and he comes down again, and perhaps he is a little elated. The next day, and perhaps for three or four days, much the same will happen, but then he begins to find that he is not quite up to the mark. He also begins to find, or other people find for him, that his observations are not quite so accurate. In other words, the aviator is getting stale. The real function of the medical man attached to an aerodrome is to watch this point, because it may be that the man is sent up and he comes down with a crash and gets killed.

"The trouble is that the best men are sent up. A superior officer wants a man, and he asks the commander to send along one of his best men—it may be from a unit where the medical man knows nothing about air illnesses. What it wants here is a medical man with some force of character, who will say in a case of that kind to the general, 'You must not send that man; it is not safe.' This is, I suggest, the chief function of a good air doctor.

A medical man should be about when men are being selected for special flights, to see that the men are in a fit condition to go up, and if they are not, to tell the commander that he must take somebody else. A man may have done himself pretty well the night before. It is then for the doctor to say to him, 'My dear boy, you are not in a fit state to go up this morning.' Not that he is seedy at all, but that he is not in that absolute state of training that he ought to be. In fact, a medical man of the Air Service ought to stand in much the same relation to the men as an athletic trainer to those whom he trains.

"The Air Force in this respect needs very careful doctoring and needs a better class of doctoring than either the army or the navy. I have heard many a doctor say that an aerodrome is a deplorable place to be sent to, for they have nothing to do. If this work is done properly you will need double the number of doctors at your aerodromes that you have at present.

Physiological Effect of Reduced Air Pressure

"There are also what may be termed air diseases. There is one disease which, is in my opinion, of importance, and that is what follows as the effect of reduced atmospheric pressure. Deep-sea fishermen will sometimes have noticed when they have pulled a fish up from the bottom something that looks like its stomach sticking out of its mouth. As a matter of fact, it is the air bladder of the fish, and it protrudes owing to reduction of the pressure from that in the depths where the fish lives, allowing gas to escape from its blood and tissues and collect in the gall bladder. A similar thing may apparently happen to the aviator at high altitudes. One of the things to which airmen fall victim is distention of the intestine, leading to great pain and vomiting. The cause of this condition at first puzzled the medical officers very much, but as a matter of fact, the intestines have become distended with gas, probably on account of the diminution in the air pressure, and he will get all right in a few days if he is only given a rest.

"The first conclusion to be drawn from the above points is that the study of the special ailments and disabilities of flying men is as much a special subject as ophthalmology, bacteriology, etc. It follows as a corrollary to the above that no medical man can reasonably expect to become efficient in the study and treatment of these disabilities unless he is prepared to devote the whole of his time and energy to the subject; and no medical man will be prepared to do this unless he can be reasonably assured of the opportunity permanently to pursue his studies and put them into practice. If, therefore, there is to be a serious attempt to deal satisfactorily with the various conditions in question, most of which are at present very imperfectly understood, it is essential to have a service of medical men specially trained for the work, accumulating knowledge with experience, with adequate inducements, to devote themselves wholeheartedly, and permanently, or quasi-permanently, to this work. By no other means can justice be done to the flying man."

Much Work for Medical Man

Mr. Pemberton-Billing expressed the view that a medical man at an aerodrome should be the most occupied officer in the whole of that aerodrome. He does not want to bother the pilots, but he wants to mix with them, to watch them as a specialist watches peculiar nervous cases, without, however, letting them know that they are watched. He wants to be always the guide, philosopher, and friend to all pilots, especially young ones. He wants to have peculiar medical knowledge and peculiar and special training properly to perform his work.

"There are very few pilots who do not know when they are beginning to get cold feet, but there is hardly a pilot who is prepared to admit it. When he comes down from a flight, or from returning from some particularly exciting or nerve-racking experience, and feels his nerves a bit shaky, a pilot feels that if he were to say so his fellow-officers would accuse him of having cold feet, and the next thing to happen would

be to invalid him out of the service because he was of no further use as a pilot. Fear of that sends many a man into the air, and is responsible for many of what we call the peace-deaths in flying.

"If there was a sympathetic, experienced medical man, who only needed to look into the eye of a man when he came down, to see that his nerve was not what it had been; and if he were to simply say 'stop flying for three days,' it is almost impossible to exaggerate the enormous relief which that man would experience at getting the opportunity of restoring his nerve without having to admit that he gave in. That is why we want a Medical Service for the air."

Production Behind Schedule

Mr. Joynson-Hicks said that 3 months had elapsed since the bill creating the Air Council had become a law and 10 weeks since the Air Council was created, and they were still looking forward to the time when it would be possible to announce to the House the issue of orders-in-council consolidating the two forces into one.

Referring to the subject of air craft production, this had not come up to the figures given to the House by the Prime Minister in July of last year. The strikes which had occurred at the airplane works did not account fully for the difference. Referring to the strikes, Mr. Joynson-Hicks suggested that some of the younger wounded men back from the front be sent into the airplane and engine factories in England in order that the employees there might be told something of the needs of the work and the consequences of any delay in the output.

Standardization of Types

With regard to completely new machines there should be no constant tinkering alterations, in the hope of getting small benefits and increases of speed on existing machines. The one message that came back from the front was to "tell them not to be always tinkering and trying to improve machines." If a new one could be produced with an advance of 15 or 20 m.p.h., all well and good; but there is no use trying to increase the speed on existing machines by a mile or two per hour. The Air Council therefore would be well advised to try to prevent the designing department from making these constant alterations which delay production more than anything else.

It was also desirable to reduce the number of engine types. At the end of last year there were actually being delivered, under contract, twenty-eight different types of engines to the British Air Services, without mentioning experimental engines which were also being constructed.

This involves the necessity for a supply of twenty-eight different sets of spare parts. As soon as possible the Air Council should follow the German plan of reducing the number of engines. They should not attempt to standardize to such an extent as to prevent further improvement. Whenever standardization had been called for the reply had been that that would prevent improvement; but it did not seem to have done so in Germany, where only five or six types of engines were being used at the outside. Mr. Joynson-Hicks suggested that eight or ten types of engines might be used, instead of the twenty-eight different types now being delivered.

Output Must Be Increased

Then there should be an increase in the output of engines. It was no use going on with the present engine factories; they must be increased and if possible doubled, and to do this, the War Cabinet must be approached and made to realize that an increase in the aircraft production was more important than increases in some other branches of munitions.

Mr. Joynson-Hicks also expressed his appreciation of what was being done in America. He said that a first appropriation had been made of $640,000,000 for the air services, which was a very large sum, when it was considered that in America only a year ago, when the country first entered the war, there was only one factory making airplanes, and these only training machines. At the time of the meeting, 11 months after the United States entered the war, they had over 400 men and 1000 civilians working, in order to turn out their share of airplanes and airplane engines.

The Air Council should stir up the Ministry of Munitions and the Board of Agriculture to grow more flax. To show the thoroughness with which the American Air Board had just gone to work, Mr. Joynson-Hicks mentioned that the Americans had sent to Bombay for castor beans for seed in order to enable them to grow these beans in the United States, so that when the time came they would be able to produce their own castor oil for engine lubrication.

Mr. Pemberton-Billing thought that with an adequate air force it might be possible to end the war successfully in 1918. This adequate force can be obtainable only by adopting a definite policy and sticking to it "through thick and thin." That policy, he said, was standardization.

Standardization is a very serious policy even in commercial life, but when it comes to military life it is attended by even greater danger. But I put it to the Government that the time has come when it is possible to standardize three distinct types of machines which are necessary for our efficiency and for our success.

Three Classes of Fliers

The time has also come when it is possible to standardize the three types of pilots. I see time wasted in training a man as a night flier who may be fit to be a day fighter and should be trained for that. If you are going to make a man a night-flying pilot you can train him approximately in three months. Make up your mind what you are going to do with a pilot, and train him for the purpose which he is competent to carry out.

There are three distinct jobs for pilots. The first job, which calls for the least skill, is night bombing. The man has simply to be able to judge a compass and read his instruments, and it is the simplest thing to teach him to fly as a night-flying bomber.

Then there is the question of the day-bombing machines. One of these machines requires a man of greater skill and of a totally different type of courage. The night flier deals with an unknown danger, the day bomber deals with a known danger, an apparent danger, and this is where our Medical Service can help us so much. In the case of the night-flying bomber who deals with an unknown danger, his nerves might possibly be affected if he were called upon to face a known danger. Again, the day-flying bomber has to fly a totally different machine, and some fighting experience is absolutely necessary, which, of course, means another type of man.

Some men rapidly develop as first-class air fighters, and other men when they become thirty or forty years of age. The man at the latter age becomes a first-class fighting pilot for the reason that he has been through all the experiences. He has taken all risks that have to be taken, and he settles down with a steady nerve.

What I want is that the Air Service should consider the advisability of training special men for special jobs, and should recognize that pilots are of three distinct types, and should be trained accordingly.

Four Types of Machines

We have the fact that we have three types of pilots, and we come to the other interesting fact that there are but four types of machines which it is necessary to standardize. The first type is the fighting machine, which I suggest should be standardized at least every month, and the drawings for that machine should only be given to firms capable of an output of at least twenty-five machines a week. If they are given a month's start and are only called upon to commence five weeks after their drawings, and if there is a competent drawing staff, or rather a competent distribution staff, they will find it possible to turn out the machines at the rate of twenty-five per week after five or six weeks' notice if there is any organization, but that is only on the one condition that the Air Service standardize the fittings.

Foibles of Designers

It is foolish to say that it is not possible to build ten types of machines with the one standard type of fitting. Men claim superiority in the performance of one aeroplane against another because some gadget which they have designed is fixed on it. If the authorities came and took the gadget off they would find that the performance was just the same.

What is necessary for success is that every part of the aeroplane shall be one working harmonious whole.

The average designer likes to claim some particular point about his machine, and he adopts some elaborate form of fitting which most probably reduces the head resistance by half a square inch. These elaborate fittings may require 500 or 600 drawings, and all previous fittings are scrapped, and the output is held up for five or six weeks, or sometimes for as many months, simply because the designer and the officials hold that a certain type of fitting must be put into the machine or the performance cannot be got out of it. That is all bunkum.

The people responsible for our Air Service to-day could simply decide round a conference table to standardize a certain type metal fitting. They could do so for four complete set of fittings. They could have one for fighting machines, and they could standardize two complete sets of fittings for observation and day bombers, and they could standardize another set for night-flying machines, and then there would be some chance of standardizing the general design of machine.

It has sometimes been found that there was a rotten performance, although the designer and the engine builder and all concerned had done their best, and then they happened to bring a man down who is a born erector, and he has made a few small adjustments and put up a performance of that machine beyond anything of its type before. The true success of a machine is in the little details, and is not in any way affected by the fittings pure and simple.

We come to the question of engines, and I think it is correct to say that the Naval Air Service has been employing twenty-six different types of engine and the Royal Flying Corps eighteen. I ask the four or five members who are present just to appreciate what it means to employ forty-four different types of engines with some two or three hundred spare parts for every engine.

The Germans have very little imagination, but we would do well to copy them in some things, and in this in particular. We would do well to copy them in the methods which save the labor that we employ in the production of machines—labor expended in needless finish—which something like halves our output. Anyone who had the opportunity of inspecting a German machine would find, once you had torn the fabric off, the work underneath, while efficient, was comparatively rough. Where workmanship is not necessary it is not put in; where workmanship is necessary it is put in. How many German aeroplanes have crumpled up over England through their own volition? None that I know.

Air Reprisals

Mr. Joynson-Hicks referred to the subject of air reprisals. He said London must be defended, and it was being defended very much better than formerly. Whenever this subject had been taken up on former occasions they had been told by the War Office that it was impossible to bring machines from the front for the purpose. The Under Secretary of State for War had said the other day that in one evening there had been seventy machines up. They involved a number of men, of machines and guns being kept in London which otherwise would have been used at the front. The invasion of London by Germany had a very definite military object, and that military object had been achieved by the Germans coming to London, which called for the use, night after night, at London of all these machines and men and an enormous amount of ammunition which would otherwise be used at the front. If the British were to make the same attack on the Rhine that the Germans made on London, Germany would have to keep machines, men and guns there, not in one particular spot but all along the whole Rhine.

The war would be won by whichever country could keep its morale longer. In explanation of the failure to conduct such air raids it had been said there were not sufficient machines. That might be sufficient explanation for Lord Rothermere, but it would not excuse the Government.

Intake Manifold Design

By R. Benson Hall

WE are waking up to the fact that the automobile must be redesigned to use either less gasoline or else a substitute for gasoline. In 1914 there was considerable discussion as to the possible use of a substitute, but aside from bringing to light the limitations of kerosene, alcohol and other fuels, very little was accomplished.

The problem of fuel shortage is now one of more than academic interest; it is, in fact, the most important automotive engineering problem to-day, and has led to some very serious thinking on the part of engineers in general. One of the most promising factors in connection with our present-day research is the fact that two and even three times the mileage may be had from the same gallon of gasoline. The factors of design that enter into economical operation are: reduction of car weight, reduction of friction losses, and increased economy of engine operation. Many direct and indirect methods of increasing engine economy have been tried, with varying degrees of success, and in this connection may be considered intake manifold design.

Ordinarily, the only objects in view in intake manifold design are maximum power and smooth running, little thought being given to the requirement that each cylinder should receive the same percentage of gasoline and air. It is a fact that the majority of intake manifolds used at present do not have the curves leading from the header to the different cylinders arranged so that the separating effect is the same. Thus the cylinders receive a varying proportion of gasoline and air, and the mixture past the throttle valve must be rich enough to fire the cylinder with the greatest separating action, while the remaining cylinders must receive a slightly greater proportion of gasoline than is necessary for best results.

In tuning up an engine we adjust the mixture so that all cylinders fire smoothly. We can reduce the proportion of gasoline so that only one or two cylinders will fire and the others will spit, or miss entirely. Therefore, we increase the amount of gasoline until the engine runs smoothly; thus some of the cylinders get a rich mixture, as is evidenced by excessive carbonization in some of the cylinders.

Uniform proportioning of the cylinder charges may be accomplished by using a separate carbureter for each cylinder, or by designing the intake manifold so that the functioning of each branch is the same. A careful consideration of the case will prove how difficult it is to design a really well-balanced manifold. In some engines a siamesed intake would meet all practical conditions. There is only one type of intake manifold that can be used on any engine and that will satisfy all practical as well as theoretical considerations, namely, the loop type as used on the Franklin engine. While this type does not give quite as much power at high speeds and full loads, it will solve the most difficult manifolding problem, and make a very smooth running engine as well. The passages must be comparatively small and of smooth interior so that a high velocity of gas may be maintained. It lends itself to hot spot construction, and it may be heated over its entire surface when necessary.

A short time ago it was the duty of the writer to design a manifold for an engine that until then had defied all attempts to make it smooth-running and flexible; in fact, the problem was believed to be unsolvable. A cast iron affair was laid out, of the loop type, two straight passages connected by round ends, the carbureter connecting in one side, and the inlet ports in the other, the entire manifold being heated for use with kerosene. When finished the smooth unbroken surface of the casting proved that it is possible to make a slightly loop manifold, which is efficient as well, for when it was put on, the engine ran very well. While cast iron was used in this case for special reasons, it is usually advisable to use steel tubing with cast fittings, as this construction offers the least resistance to gas flow.

Traction on Bad Roads or Land*

Part IV

Efficiency of Chain Track Tractors—Drawbar Connections — Mechanical Details of Various Designs of Chain Track Tractors

By L. A. Legros

CHAIN-TRACTOR makers are nearly unanimous in their estimates of the loss of power that takes place between the engine and the ground. The power delivered at the track is estimated at from 70 per cent in the large 100-hp. tractors down to 55 per cent in the small tractors of 30 hp. and under. The force required to haul the track itself apparently varies from 15 per cent of the weight carried in the fixed-roller type with plain bearings to 2 per cent of the weight carried in the traveling-roller type of track, or its equivalent.

The difference between the two constructions in loss of tractive effort may be attributed in part to the fact that it is easier to insure efficient lubrication in a roller system that is loaded intermittently than in one which is subjected to continuous load in one direction.

The comparatively heavy resistance to traction in those chain-track tractors in which the load is carried through rollers running on fixed axles is reduced in some cases by fitting roller bearings, of the Hyatt pattern for instance, on the roller-wheel shafts. These do not, however, reduce the lateral friction on the flanges and bosses of these wheels, which depends on the supply of grease that can be forced in through the pins by lubricators of the Stauffer type. Roller bearings so fitted will, of course, reduce the starting effort; nevertheless, it appears to the author that, of the several sources of friction contributing to losses in the chain tracks, the lateral friction of parts of the system of carrying rollers, where the rollers revolve on fixed axles, probably accounts for more than half the total loss of tractive effort.

Experience, gained in comparative tests of the fixed axles and roller-chain systems made over a long period under the same working conditions, will be necessary to determine the cost of upkeep of each; the same tests will also show how far the extra complication of the intermediate traveling chain of rollers is compensated by reduction in fuel consumption.

Climbing Power

The drawbar pull varies in different types of vehicle from 30 per cent to over 70 per cent of the weight of the vehicle; a heavy tractor weighing 28,000 lb. can exert a drawbar pull of 12,000 lb.; a small tractor of 30 hp. can exert a pull of 3500 lb. The steepness of gradient that these vehicles can climb is consequently very great.

On railway gradients are measured as the tangent of the angle of inclination, the rise being referred to the plan of the track. In the case of hill climbing tests of automobiles the maximum gradient climbed rarely exceeded 1 in 3; for this value of the tangent, the angle with the horizontal is 18 deg. 26 min., of which the sine is 0.3162; that is to say, the actual length of the road, in elevation, is about 5 per cent more than that given in plan. As some chain-track tractors are capable of climbing a gradient as steep as 45 deg., it is necessary to refer climbing and haulage problems to the actual road length, which for an inclination of 45 deg. is over 40 per cent greater than the length in plan. Thus a vehicle capable of exerting a drawbar pull equal to 50 per cent of its weight can climb a slope of 30 deg. provided that the ground present sufficient adhesion; and a vehicle capable of exerting a drawbar pull equal to 71 per cent of its weight can climb a slope of 45 deg. provided that a sufficient bite can be obtained by the tracks on the surface.

The tractive effort for ordinary railway practice at speeds not exceeding 5 m.p.h., and therefore free from questions of air resistance, varies between 9 lb. per ton (0.4 per cent) for the train hauled, and 12.5 lb. per ton (0.55 per cent) for the train including engine and tender; on tramway rails the tractive effort varies from 30 lb. per ton (1.34 per cent) wet to 56 lb. per ton (2.5 per cent) dry; on ordinary roads the effort varies from 70 lb. per ton (3.1 per cent) on macadam to 120 lb. per ton (5.4 per cent) on good gravel roads, and it is much more on bad gravel roads and across fields. The inclination of the ground on which chain-track tractors will roll back varies from 1 in 7 for the fixed-axle plain-bearing roller type to 1 in 50 for the independent roller chain or its equivalent.

In comparing chain-track tractors with other vehicles for resistance to traction it must, however, be remembered that the resistance with fixed roller tracks, which may amount to 14 per cent for the tractor itself with its gear, or to 9 per cent for a trailing tractor, is not greatly increased by conditions under which a wheeled vehicle sinks so deeply that the tractive effort required to haul it may amount to 40 per cent of its weight. Conditions produced by swamp or sand can be such that no horse or wheeled tractor could haul the load at all, yet they will present no difficulty to the chain-track tractor.

Drawbar Connection

In vehicles exerting so heavy a drawbar pull as is possible with the chain-track tractors, it is of great importance that the drawbar connection should be placed as low as practicable without unduly reducing the ground clearance. The couple formed by the drawbar pull at the height of the drawbar, and the ground resistance, acts on the frame of the tractor in the same direction as the couple due to the tractive effort applied at the sprocket teeth; both tend to cause the front of the tractor to rise, and, as will be seen from Table II, the portion of the load carried on the front wheel is usually small. For this reason it is advisable in designing vehicles of short base and heavy drawbar pull that the drawbar shall be placed low. In vehicles intended for soft and marshy ground it is desirable to use wider treads rather than to attempt to obtain very great ground clearance for the drawbar. For this reason many makes are fitted with alternative widths of chain track according to the land on which they are at work.

The horsepower, engine dimensions and speed, tractor speeds forward and reverse, track width, length of the track in contact with the ground, weight on track, weight on steering wheels (if any), load per square inch of track, dimensions of steering wheels, radius of turning circle, pitch of chain, capacity of petrol, water and oil tanks, drawbar pull, and ratio of drawbar pull to weight of tractor are given in Table II.

The chain tracks in the Creeping-Grip tractors carry the

*Paper read before the Institution of Mechanical Engineers on Jan. 18, 1918.

tractor on wheels mounted on short axles fixed in the track frame. The whole of each track frame is pivoted about the axle, which passes through its center (see cuts). This axle merely carries the track frames. Power is transmitted from the gear-box to two pitch chains, which drive the two chain sprockets; each of these is fixed to a short shaft running in bearings on the track frame between the fixed axle and the sprocket; these shafts each carry a lantern wheel, which engages with the sprocket wheel, the pins in the lantern wheel being of the same diameter as those in the chain links, but the lantern wheel pins engage with each tooth of the sprocket, whereas the chain pins engage with the alternate teeth.

In the 75-hp. "Giant" and 50-hp. "Senior" models the weight is carried on four pairs of wheels in each truck; in the 30-hp. "Junior" there are only three pairs of carrying wheels. The upper part of the chain is carried on three pairs of wheels in the two larger tractors and on one pair of wheels in the 30-hp. model. The gear-box is fitted with sliding dog-clutches, the gears being permanently in mesh; the differential gear is of the spur-wheel type. The motor of each model is governed.

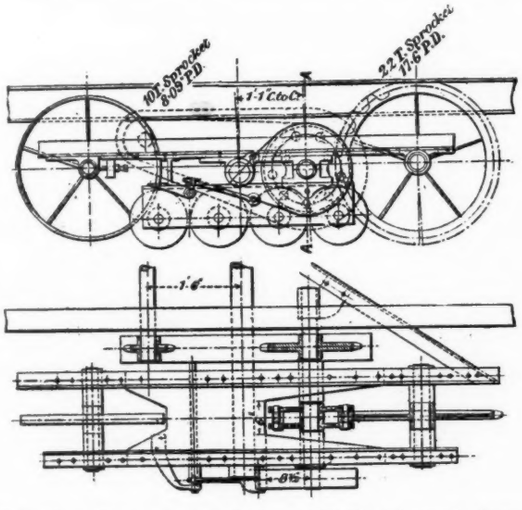
The front axle of the 75-hp. and 50-hp. models has Ackermann steering and a centrally pivoted leaf spring which bears on the two axle ends and supports the front of the tractor in the center; the arrangement, which is similar to that of the Centiped (Phoenix), gives three-point suspension. The 30-hp. model has a single front steering wheel carried in a forked frame and controlled by a worm and wheel gear.

The small 16-hp. "Baby" has no front wheel, and is controlled by independent clutching of the two chain tracks; it is possible to reverse either track independently for turning a circle of small radius.

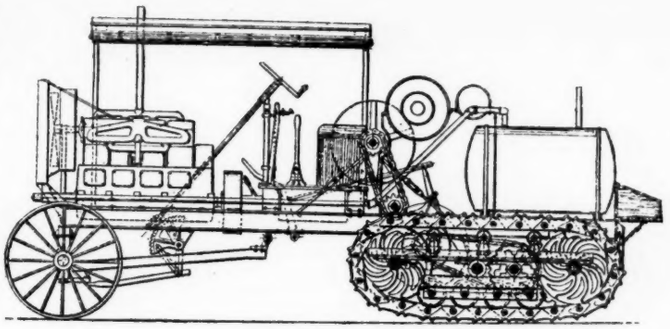
The Austin Tractors

The F. C. Austin Drainage Excavator Company, of Chicago, are makers of two models of chain-track tractors. The 35-hp. tractor, like most American low-power tractors, is steered by declutching the tracks. This model is supported on six pairs of wheels to each track, which has a normal width of 12 in., but the shoes, which are formed of flat plate with two corrugations, can be widened by bolting to them 36-in. treads of wood reinforced with steel plate; the insistent weight can thus be reduced from 4.7 lb. per square inch to 1.78 lb. per square inch—the lowest figure given in Table II. The arrangement obtained by bolting wide treads to the shoes is liable to the disadvantage of damage or jamming by stones or sticks due to nut-cracker action; generally tractors working with very low insistent weight are used for culivating swampy land on which stones do not exist.

The 15-hp. Austin tractor is very similar in construction to the larger model described, but is supported on two pairs of wheels only for each track; the insistent weight is 4.7 lb. per square inch, and the tractor can be used for hauling a



Creeping Grip Senior, 50-hp. Detail of track frame and drive



Creeping Grip Senior, 50-hp. Side elevation

gang of four disk plows, ditching, road making or grading.

The Cleveland tractor is of much lighter construction than the machines previously described, having been designed with a view to the exigencies of work in this country, where it is necessary that the headlands should be kept as small as possible. The tractor has no front wheel, steering being effected by brakes on each side of the differential, operated by the steering wheel.

The load is carried by three pairs of wheels, and the slack part of the chain is carried on a single wheel.

The engine is of the ordinary four-cylinder type carried in the main frame by three-point suspension. The exhaust is led through a sleeve jacket on the lower part of the induction pipe; this allows the use of inferior fuel such as kerosene or creosote waste.

The front end of each track frame is formed with a yoke encircling the track chain, and is connected by links to the end of a cross-spring the center of which is secured to the main frame by U-bolts in the usual manner. The tracks can oscillate about the axis of the back axle.

It is to be noted that in all the vehicles described of this class the torque applied to the sprockets, which tends to lift the front of the vehicle, has the further effect in cases where the track-frame is pivoted, as in the Tracklayer and Creeping-Grip tractor, of increasing the insistent load on the front of the track itself.

Strait Tractor (Killen-Strait)

This tractor presents several original features; the unsymmetrical driving track frame, with its axle placed high and far back, carrying the driving sprocket over which the chain passes; the series of three pairs of large-diameter wheels under which the chain track runs; and the spring arm which, by means of a helical tension spring, keeps the front of the track in contact with the ground.

The drawbar is attached to the frame by a swivel joint forward of the back axle, and it swings clear below the axle. The motor drives through a cone clutch to the gear-box, which is of the sliding-gear type with reverse through bevel gears; the drive to the differential, which is of the bevel-gear type, is effected through spur gears; one driving sprocket is carried on a sleeve to which one bevel wheel is fixed, the other bevel wheel and sprocket being both keyed to the axle. The steering is operated by worm and wheel fixed to a track frame supported on a helical spring. This frame carries a miniature track of 15 treads. The load is carried through three pairs of wheels to the track frame; the front axle of these is adjustable for taking up wear. In climbing steep banks or in crossing ditches this front track is sometimes quite off the ground, behaving somewhat similarly to the leading wheel of the Clayton tractor, but with the difference that whereas in the Clayton tractor the track frame is fixed and the whole movement taken by the front wheel, the movement in the Strait tractor is partially taken up by the spring on the front track column and partially by the springs that control the rocking action of the driving tracks.

In the Strait model 3 tractor, the power is applied to a single chain track at one side of the vehicle; this track is of similar construction to that of the ordinary model just described. The steering track carried in front is also similar to

that already described both in form and in spring suspension, but it travels in the same path as the driving track. The engine is carried to one side of the main or driving track, and the machine is supported on the extreme left by a wide carrying wheel or roller, which runs freely, but can be adjusted laterally on its spring-supported axle.

The gearbox is fitted with a single gear and reverse, but the engine speed is made variable, as in the ordinary motor lorry. The arrangement of the draw-bar attachment in the Strait tractors is kept low and forward so as to increase the load on the front of the tractor when hauling and consequently to gain adhesion.

The Ball-Tread Tractor (Yuba)

In this form of tractor, the weight is distributed over the chain track by two rows of steel balls 2.25 in. diameter, and is carried on ball races of annealed cast steel, built into the track frames. The ball-race sections carried on the shoes are of L-form; those on the track frame are, in section, of the form of a circular arc. Thus each ball bears against two faces at right angles to each other on the shoe and against the appropriate portion of the curved section of the track race. It is claimed that this method of carrying the side-thrust renders the arrangement peculiarly suitable for use on side-lying ground. The ball races are kept supplied with heavy lubricating oil when at work.

The track frames are pivoted about the rear axle, which also carries the driving sprockets; the front of each track frame is connected by compression springs, with a bracket carried on the main frame. The driving sprockets are each formed with an internal spur gear, into which gears the pinion carried on the corresponding cross-shaft of the gearbox. The clutch gear is such that the drive to each track can be reversed independently, enabling the machine to be turned in about its own length. The transmission gear is fitted with roller bearings for taking radial loads, and with ball bearings for axial loads. The gearbox is arranged with two speeds forward, and the same for reverse.

Steering is operated by wire-rope connections from the steering-wheel shaft to the front wheel frame, which runs on ball bearings. The speed changes are controlled from the operator's seat, and there is a foot accelerator for the motor.

This is a vehicle of lower power than the majority of those described above; it has been designed with the object of meeting British rather than overseas conditions. Each track chain passes round two idlers on the track frame and over the track sprockets carried on the main cross shaft. Either sprocket wheel or both can be engaged with the cross shaft by means of dog clutches. The tracks are arranged at the front of the machine, which weighs about 30 cwt. including the three-furrow plow.

Steering can be effected by a single central wheel, carried in a castor frame, for use when plowing, or by a pair of steering wheels mounted in a carriage and operated by means of a pinion and quadrant.

(To be continued)

Methods of Testing Airplane Engines

IN taking up the manufacture of aircraft engines one of the chief problems that confronts manufacturers is that of an adequate testing equipment. There has been considerable discussion as to the relative advantages of fan brakes and electric dynamometers, and there is as yet no unanimity on this point. In this connection it is of interest to point out that the Fiat Co. of Turin, Italy, uses water brakes. These are accurate, convenient, and capable of absorbing the power developed by the most powerful engines, and we believe the Fiat company manufactures aircraft engines of 600 hp. and over.

The engine to be tested is rigidly mounted on a cast-iron base which can be adjusted in any direction so as to facilitate lining up with the brake. Between the engine and the brake is an elastic coupling composed of flexible steel discs, and close behind the coupling is a flywheel which serves the purpose of steadying the running of the engine.

Exhaust gases are disposed of in such a manner as to cause absolutely no inconvenience to the testers. With the exception of the short length of pipe from the engine manifolds, all the exhaust piping is underground. There is a water jacketed pipe with a suction fan at its end which discharges into the open air a considerable distance away from the test room. The exhausts from the individual stands pass underground into this main pipe. With this system the test room is kept clear of exhaust gases, and noise is so much reduced that with a full battery of engines under test—developing several thousand horsepower—nothing more than a dull rumble is heard outside the factory walls.

Another interesting feature is the arrangement of fuel and oil supply. The main fuel tanks are placed in a room some distance away from the test shops and are mounted about 10 feet above the level of the ground. The gasoline feed pipes are taken underground from these tanks to the test room, being carried through the permanent stand to within a couple of feet of the carbureter, so that there is only a very short length of external piping. This arrangement reduces fire risks to a minimum.

In addition to these main supply tanks for each engine there is provided a safety tank with a capacity varying from 5 to 10 gallons, mounted on a balance just sufficiently high above the carbureter to give gravity flow. This is made use of for the fuel consumption test. Without stopping the engine the operator can, by means of a three-way cock, shut off the flow from the main tank and open the auxiliary tank. Having noted the weight of the tank before bringing it into service, and reading the weight when he shuts off the flow, the differnece gives him the weight of fuel consumed in a given time.

There is a somewhat similar system for the oil supply, the oil being contained in tanks independent of the engine, and also mounted on balances so that a reading of the weight consumed is available at all times. On its return from the engine the oil is passed through a water jacketed cooler.

After the engine has been run light for a short time, in order to ease the bearings and make minor adjustments, the speed and load are gradually increased until the engine is ready for its official test. Normally this occupies 10 to 12 hours. During this time horsepower readings are taken, the temperature of the cooling water is noted and as often as considered necessary—but without stopping the engine—fuel consumption tests of 15 to 20 minutes' duration are run.

All requirements having been met in this test, the engine is completely dismounted, examined for abnormal wear, reported on, then reassembled and returned to the test shop for a final full load test of one hour. After this it is taken off the bench, cleaned, inspected and sent to the shipping room for delivery.

While airplane engines are tested at practically sea level, they have to do most of their work at altitudes of several thousand feet. This involves very complex problems, and in order to secure accurate data it has been proposed to build special test rooms in which a low atmospheric pressure is artificially maintained. The Fiat company is fortunate in having almost at its doors the high Alps with good roads leading to their summits, where it is possible to make accurate tests at altitudes of 6000 to 8000 feet above sea level. Of course only a few engines are subjected to this altitude test, but the data obtained are of general application. It is said that these Alpine tests have yielded valuable information concerning the effect of altitude on compression, carburetion, valve timing, cooling of the cylinders and oil and ease of pick-up after sudden cooling (corresponding to a long, fast glide).

Revere Car Has Duesenberg Engine

A NEW four-cylinder car, fathered by three men with extensive race track experience, has made its appearance in the Middle West—the Revere, manufactured by the Revere Motor Car Corp., with its main office at Chicago and factory at Logansport, Ind. It is the design of Gil Anderson, who piloted the Stutz in many of its victorious speed contests and who is now the chief engineer of the Revere concern. Tom Rooney, also a former Stutz pilot, and Adolph Monsen assisted in the production of the new design.

As offered to the market the Revere is constructed for fast road work and looks fast even in the touring types. It appears to date as a speedster, a four-passenger sport model and a six-passenger touring car. The price varies from $3,500 to $3,800 depending on the style. It is featured by a 4⅜ by 6 in., four-cylinder Duesenberg racing type engine, a special design of frame, and spring suspension which is of Anderson's own design.

The general type of the car may be judged from the following brief specifications. The chief components include a four-speed gearset with direct on high in a unit with the engine, the drive being taken through universals to the floating axle with a final drive through spiral bevel gears. The clutch is a dry disk with fabric facing. The torque is taken up through two rods, one on either side of the propeller shaft. The wheelbase is 130 in., tires are 32 by 4½ in., Goodyear cords on wood or wire wheels.

Equipment includes a Bosch magneto, Bijur electric system, Miller or Stromberg carbureter and Hartford shock absorbers.

It is unnecessary to go into the detail of the Duesenberg engine, except to say that as supplied in the Revere it has the same features of design that has made it successful on the track.

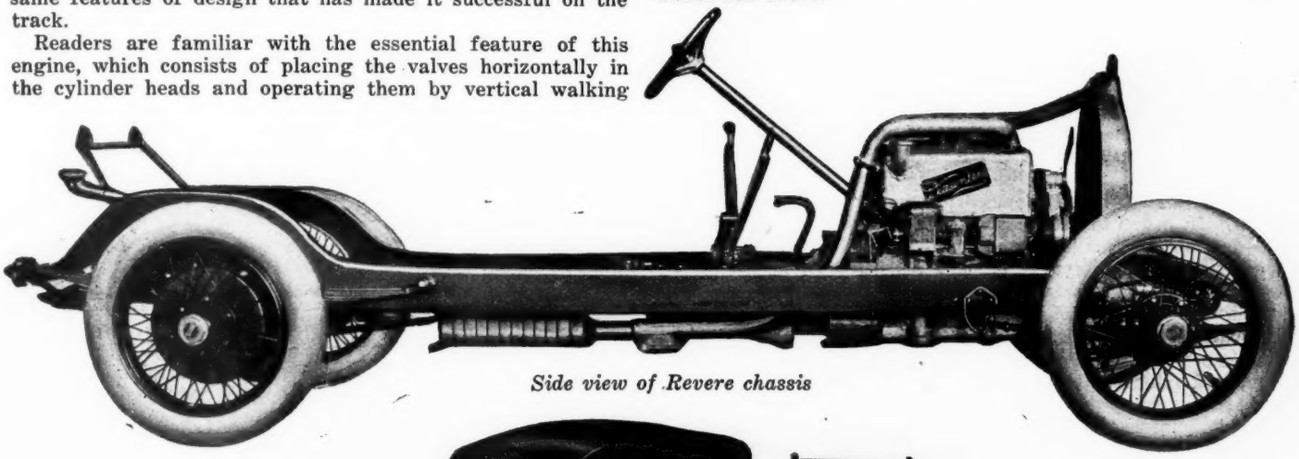
Readers are familiar with the essential feature of this engine, which consists of placing the valves horizontally in the cylinder heads and operating them by vertical walking beams. With this engine the Revere people claim a speed of 85 m.p.h.

Special features of design of the rest of the car center chiefly around the frame. In this Anderson has developed a special shape with the object of making the car hug the road, making it easy riding and at the same time have it hang low enough to insure both speedy appearance and safety. The frame members have a double kickup, one over each axle. This is indicated in the side view of the chassis, which shows the exceptional height of the rear kickup. The front springs are conventional, but the rear spring is a special design which while semi-elliptic in form gives the cantilever effect, it is claimed, except insofar as the rebound is concerned.

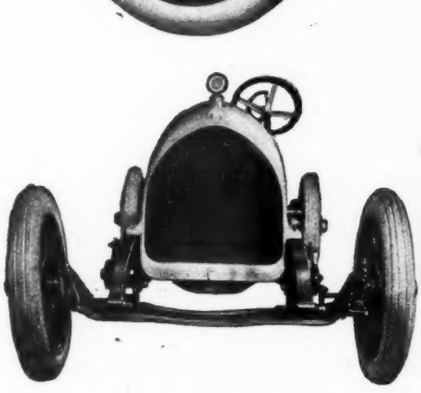
Throughout the entire chassis the effect of racing experience is evident in the care to provide easy and adequate lubrication and also to relieve bearing friction where possible. The former is shown in the disposal of the grease cups which are in evidence on every moving part and are so placed that they are very easy to refill. Such means as ball bearings on the gearset shafts, and so on, indicate efforts to cut down friction. There is a special stud, made a part of the frame, to take the Hartford shock absorbers which are stock equipment, so that for the first time in American practice the shock absorber becomes really a part of the chassis and not an afterthought.

One of the special features to be appreciated is the brake adjustment, which is accomplished by means of a small hand wheel made accessible by lifting a floor board.

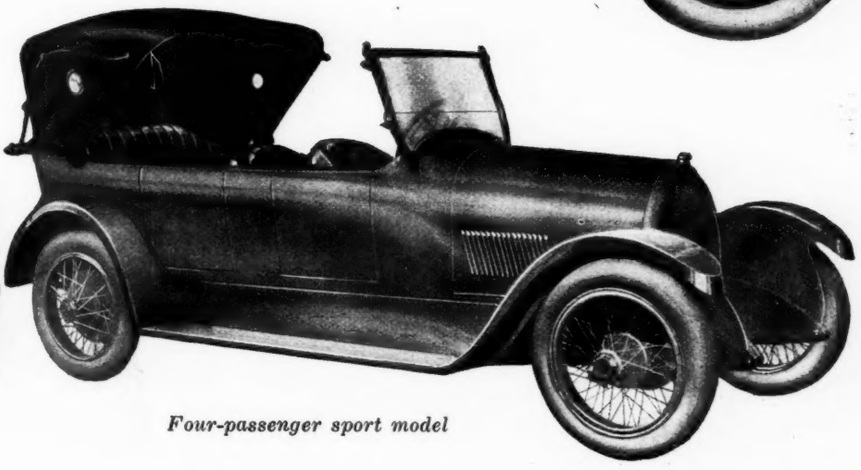
No attempt at quantity production will be made and consequently the matter of body styles will be left to a large extent to the purchaser. There will be additional styles to those mentioned above.



Side view of Revere chassis



Front view of the Revere



Four-passenger sport model

Shock Absorbers for Automobiles and Ambulances

S. A. E. Pennsylvania Section Discusses Devices for Modifying the Action of Chassis Springs—May Be Divided Into Three Classes

SHOULD a shock absorber retard the motion of the spring merely on the recoil or should it act during both compression and recoil? This was the question around which centered most of the discussion during the March meeting of the Pennsylvania S. A. E. Section. The meeting was held in the Engineers' Club, 1317 Spruce Street, Philadelphia, on the evening of March 28. Mark H. Landis of the Landis Engineering Co. read the paper of the evening, which dealt with shock absorbers for automobiles and motor ambulances.

This was the third meeting of a series dealing with the different parts which affect the comforts of driving. The first meeting dealt with springs and the second with tires. At the meeting at which springs were discussed the conclusion was reached that in order to secure the most comfortable riding qualities, springs having a low rate of vibration must be used; these springs must be capable of compressing rapidly to absorb jolts, and their action must be modified by some auxiliary device.

Paper by Landis

Mr. Landis in his paper briefly reviewed the development of shock absorbing devices. He said that in the early days of the automobile not much attention was being paid to comfort in riding. For one thing, the speeds attained in those days were low, and designing engineers were so much absorbed in the problem of making their motors reliable that they had little time left for anything else. Many of the early cars had very flexible springs and were rather rough riding on account of the violent recoil. It soon became recognized that in order to improve the riding qualities the unsprung weight must be reduced to a minimum. One step in this direction was to make the transmission a part of the power plant. In order to secure the best possible riding qualities, an ideal spring should be used, together with little unsprung weight. An ideal spring is very sensitive to shock. The trouble with such springs is that owing to synchronism between the rate at which shock may be received and the natural period of vibration of the spring, the spring may close up. All leaf springs have considerable inter-leaf friction, and experiment has shown that this friction is greater during the compression than during the rebound. In Mr. Landis' opinion the spring should be sufficiently strong to support the static load without counting on the inter-leaf friction.

Front springs on more than 95 per cent of all passenger cars are fitted with semi-elliptic springs of a small range of compression and a high rate of vibration. The result of using this type of spring is that the car rides dead. If the rear springs on passenger cars were designed on the same lines as the front springs there would not be enough pneumatic tires made to supply the demand, so rapid would be the tire wear. Mr. Landis thinks that skidding is largely due to failure of the driving wheels to keep the ground. Owing to the action of the rear springs one rear wheel may leave the ground and begin to spin. When the wheel comes down again and strikes the ground, the reaction will tend to cause the car to skid.

Illustrating Shock Absorber Action

Many schemes have been made use of to demonstrate the benefit of shock absorbers, but some of these are nothing more than buncombe. It would be to the advantage of the shock absorber industry if the manufacturers would get some real data and present it to the public. One thing that has mitigated against the popularity of shock absorbers is that car manufacturers are generally opposed to fitting any devices that are not absolutely necessary to the operation of a car. The demand for such devices has to be created by the parts manufacturer, and when it has been created the car manufacturer will buy the cheapest device of the kind that he can get.

Mr. Landis had been requested to make reference in his paper to shock absorbers for ambulances. A few days ago he had ridden in an ambulance of the 1½ ton truck type, which was fitted with very heavy springs. The riding was not good enough for a man in good health and we should pity a poor invalid who had to ride in an ambulance of this type. The springs for ambulances must be much more flexible than truck springs; more life should be put into them and their recoil controlled by shock absorbing devices.

Mr. Landis divided all of the different devices developed for modifying the action of the springs into three general classes and these into sub-classes. The three general classes are auxiliary springs which are either of the coil spring or air type, frictional shock absorbers and shock absorbers of the hydraulic or hydraulic and pneumatic type. These different types were taken up in succession and their strong and weak points indicated. In concluding his paper Mr. Landis gave an account of the development of his own shock absorber, which is of the hydraulic type. He mentioned and explained all of the difficulties which had to be overcome. One of these was due to the fact that the oil would become heated and partly vaporized, and a cushion would be formed within the shock absorber, resulting in a slap when the device really took hold. In the earlier models there was a piston rod extending through a stuffing box in the shock absorber housing, but it was exceedingly difficult to keep this joint oil tight and to prevent wear of the piston rod.

Effect of Recoil Check

In opening the discussion John W. Watson said that automobile engineers generally were under the impression that recoil checks had a tendency to lift the wheels off the ground, and he called upon the speaker of the evening to give his views on this question. The tendency of the recoil checking device, Mr. Watson said, was to always keep the spring compressed, and the greater the recoil checking action the slower the wheel would return to the ground.

Mr. Carter of the Retrac Co. explained that for a car which has to be driven at low speed over city pavements the ideal spring would be a very flexible spring. This would take care of all the little irregularities found in city pavements, and as there are no large obstructions and the car is not driven at high speed, heavy recoil need not be figured on. On the other hand, if a car is to be driven over country roads at high speeds, the springs must be made stronger. The extreme service is that of the racing car. Racing drivers generally use shock absorbers, but not for the comfort of riding, their object being rather to keep the driving wheels in contact with the road.

Mr. Waterman of the Hartford Shock Absorber Co. said Mr. Watson had asked the question why car manufacturers objected to the one-way device. The manufacturers had tested out the device and had found it wanting.

Mr. Carter observed that when a car struck an obstruction at a given speed, there was a certain amount of energy

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Advantages of Steam Outlined

In Three Papers Presented at the March Meeting of the S. A. E. Metropolitan Section the Power Range and Ease of Control Obtainable with Steam Are Emphasized

NEW YORK CITY, March 28—"Steam Automobiles" was a topic sufficiently interesting to bring out 300 members of the S. A. E. Metropolitan Section to-night, when three papers were read, two from the Stanley company and one from the Doble company. All three handled the subject in a historical manner, and spoke of the commercial advantages of steam as compared with gasoline, commenting on the fewer number of parts in steam machines, the possibility of using maximum torque under the most adverse conditions and securing the fullest efforts of the automobile at lowest speeds such as 1 m.p.h.

Prescott Warren, president of the Stanley Motor Carriage Co., introduced the subject by a historical review of steam, under the title "The Fork in the Road." By fork he referred to that period in the development of the automobile when inventive genius pursued the internal combustion engine and left the development of steam to a few individuals. Mr. Warren believes that it was the spectacular idea of obtaining power direct from fuel in the cylinder of the engine that led engineering talent up the fork of the road represented by the internal combustion engine.

The electric industry suffered what Mr. Warren described as a similar fundamental error, referring to engineers taking up the internal combustion engine rather than steam, by referring to the early days in the electric industry when engineering fashion took up the direct current, which eventually had to give way to the alternating current.

Steam Cars Have Power Stored Up

In addition to what Mr. Warren described as the complications of the internal combustion automobile as compared with steam, he emphasized that steam cars store up power, whereas in the explosion engine type the limit of capacity for storing power is confined to the flywheel. The electric vehicle has this capacity for stored power, but has four limitations: Its range of travel per battery charge is too short; it takes too many hours to restore its battery capacity; it lacks a 40 or 50 m.p.h. speed performance, and the driver is conscious every minute that he has less power than he possessed a minute previous.

Mr. Warren complimented the internal explosion engine by describing it as a marvel of ingenuity resulting from persistent inventive effort, but concluded by declaring the automobile performance that the public is demanding cannot be obtained with the internal combustion engine.

John Sturgess, also of the Stanley organization, gave some figures on the use of steam as a power, and emphasized the expression "range of power," which he used in a wider sense than the word horsepower as applied to the automobile. Range of power was described as the magnitude of force applicable to the driving wheels. Reserve power is the difference between the driving force utilized at any moment and that which may be utilized at such moment. Both are the direct result of range of effective cylinder pressures with given gear ratio and piston displacement.

Limiting Driving Forces Compared

Mr. Sturgess compared steam and gasoline cars in this respect.

The maximum mean effective cylinder pressure in the gasoline car averages about 100 lb. The steam car has in reserve cylinder pressure well up to 500 lb. Applying gear ratios and piston displacement to both types to obtain net driving effort or force, we will compare a 3⅛ x 5⅛, eight-cylinder gasoline car and a 3 x 5 twelve-cylinder gasoline car with a stock 4 x 5 two-cylinder steam car. Gear ratios will be approximately 4½ to 1 in the gasoline cars and 1½ to 1 in the steam car.

The eight-cylinder will have a piston displacement (omitting non-working strokes) of 77 cu. in. per ft. of car travel, and the twelve-cylinder will have 104 cu. in. The steam car will have 41.4. Multiplying these values by the maximum effective cylinder pressure, we obtain the following indices of driving force:

Gas car, eight-cylinder (3⅛ x 5⅛)..... 7,700
Gas car, twelve-cylinder (3 x 5).....10,400
Steam car, two-cylinder (4 x 5).....20,700

From this it will be seen that the range of driving force and consequently reserve power in the steam car is greatly in excess of either of the above typical gas cars, which accounts for the remarkable acceleration and hill climbing powers of the steamer.

The above calculations with gas cars are based on direct drive (high gear) because the accepted standard of their performance is what they will do on high gear. They are advertised, sold, and judged in service upon this basis.

"Gear Shift a Makeshift"

Of course the gas owner can shift to the low gear for greater power at reduced speed. But every time he does this he concedes the claim that the steamer possesses superiority in not doing it. Moreover, he himself will do it only as a last emergency measure; he admits with mortification that he is forced to do it; so any effort on his part to derive controversial advantage from his ability to do it is distinctly insincere.

The gear shift has well been called a makeshift. It is not a satisfactory solution of the problem. In fact, it is a most unsatisfactory solution. Every motorist is demanding a better one, and every manufacturer is trying to find it. The fact that no gear shift is needed with a steam car is one of the strongest reasons why we build such cars.

It is not claimed that the steam car can maintain the above high tractive effort indefinitely at high speed. Such would not be necessary under any road condition ever likely to be encountered. Its temporary availability is all that is desirable. Even with 400 lb. mean effective pressure, at 30 m.p.h. such tractive effort would amount to 80 hp.; at 50 m.p.h. it would equal 130 hp. This great amount of power is available for as long a period as road conditions would usually permit its use.

Value of Track Performances Deprecated

It is probably true that many stock gas cars, including the typical cars cited, could maintain a higher rate of speed on an ideal track, say Sheepshead Bay. But what proportion of the power the gas car develops on the track is available on the road? What is the value to the motorist of a track performance which cannot be duplicated on the road he is going to use?

It is not that steam cars cannot be built to meet track conditions. It is simply that in order to maintain a high average road speed beween points, with acceleration inconceivable to the gas car driver, the steam car does not have to be equipped with a power plant, capable of producing an amount of power which can rarely, if ever, be continuously used. There is small consolation to the driver who has averaged

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U. S. A. Gasoline Locomotives

Built in Three Sizes by Baldwin Locomotive Works for Use on Narrow-Gage and on Standard-Gage Tracks Behind the Battle Lines—Power Plant Auxiliaries of Automobile Type

WHEN we speak of automotive apparatus we usually have in mind passenger automobiles, trucks, tractors, motorcycles and aircraft, and possibly also motorboats. There is, however, still another application of the gasoline motor to means of transportation which has been somewhat neglected in the past but which is rapidly growing in importance in connection with war operations. We are referring to gasoline locomotives. Such locomotives are used behind the battle lines in France in large numbers, partly because they are less conspicuous than steam locomotives, not throwing off cinders, smoke and exhaust steam, and partly because they can be started instantly even after extended periods of non-use.

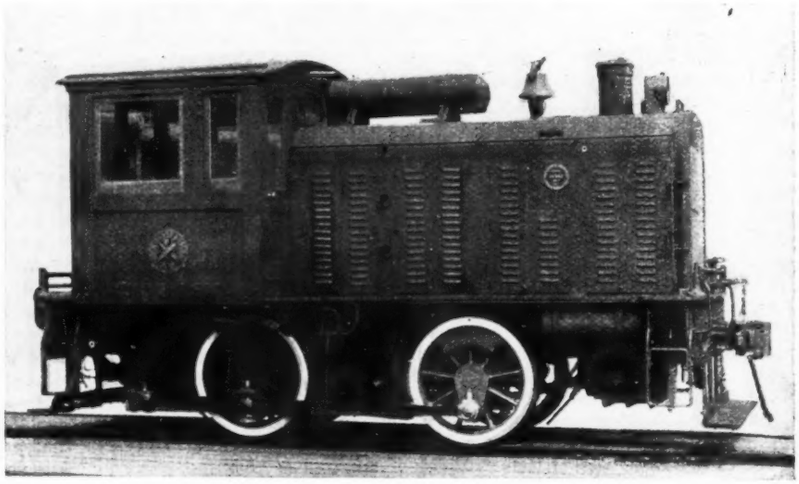
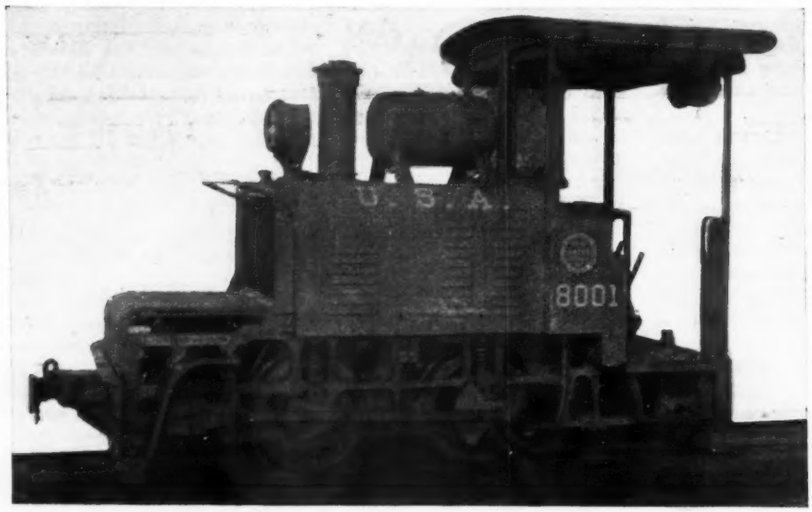


Photo showing locomotive similar to the largest size to be built

The Baldwin Locomotive Works at Philadelphia at present are building three types of gasoline locomotive for the U. S. Government, which are similar in design to types which they produced previous to the war for commercial work. The intermediate one of these three sizes is also being furnished in large numbers to the French Government. The two smaller sizes are intended for narrow-gage or industrial tracks, the tread of which in France is 60 cm., while the large size is for the regular standard gage railroad tracks of France and has a gage of 4 ft. 8½ in. All of these locomotives employ the so-called rod drive construction which was patented by A. H. Ehle, engineer of the Baldwin Locomotive Works. Instead of the engines being connected to the driving axle through toothed or chain gearing they are so connected to a jack shaft from which driving connection is made to the driving axles through long connecting-rods. Each of the locomotives has four driving wheels, and all of the weight is available for adhesion.

The jackshaft is provided with cranks at opposite ends and the two cranks are set at an angle of 90 deg. with each other. From these cranks there are long connecting-rods extending to crankpins on the farthermost set of driving wheels, and another set of shorter connecting-rods connects the cranks on these driving wheels to cranks on the other pair of driving wheels. As the crankpins on the opposite ends of each axle are set on the quarter, there is no dead-center position.

Four-cylinder, vertical, water-cooled engines with individually cast cylinders are used on the two smaller models and six-cylinder engines of the same type on the larger locomotive. All of these engines are manufactured by the Pittsburgh Model Engine Co. The engine of the smallest locomotive, which is rated at 30-35 hp., has a cylinder bore of 5 in. and a stroke of 6 in. This locomotive weighs about 5 tons, and under favorable conditions will haul a total load of 60-75 tons on the low gear. The engines are of the heavy-duty type, with liberal bearings and of sturdy design throughout, being quite similar in type to farm tractor engines. All of them are fitted with speed governors, and their speed is maintained within narrow limits.



The seven-ton U. S. A. locomotive

Fuel is carried in a 25-gal. tank on top of the hood and is fed by gravity to the Zenith carbureter. Ignition is by a Philips-Brinton outfit and the Westinghouse electric starting and lighting system is fitted together with a Willard storage battery. Ordinarily the engine is started by simply pressing with the foot on a starting button, but for

emergency starting a crank is arranged at the rear end of the cab.

The clutch is of the Hele Shaw multiple disk-in-oil type and forms a unit with the flywheel. From the clutch connection is made to the transmission gear, which affords two forward speeds and the same number of reverse speeds. The low forward speed corresponds to 4 m.p.h., the high to 8 m.p.h., and the two reverse speeds are the same. Annular ball bearings are used on the bevel pinion shaft and the upper transverse shaft in the transmission, Hyatt flexible roller bearings in the large bevel gears, and plain bronze bearings on the lower shaft. The different speeds are picked up by means of jaw clutches, the gears remaining permanently in mesh. The shaft entering the gearbox carries a bevel pinion which meshes with bevel gears on opposite sides of it. There is a spur pinion adjacent to each of the bevel gears, and these two spur pinions mesh with larger diameter spur gears on the lower part of the transmission case. The large spur gears are free upon the jackshaft, but either one can be secured to the jackshaft by means of a dog clutch. Similarly each of the large bevel gears can be secured, by means of a jaw clutch, to the spur pinion adjacent to it. All of the pinions in the transmission are of forged steel and the large gears are of cast steel. All gears are of very liberal width of face and accurately cut with teeth. Thus the pressures on the gear teeth do not reach very high values, and the gears have a very long life, especially in view of the efficient lubrication and protection from dirt. The transmission is inclosed in a cast-iron case and no attempt is made at weight saving in this part, because a certain amount of weight is required in any case in order to secure sufficient adhesion. In this respect the problem of a gasoline locomotive differs considerably from that of an automobile, for while in an automobile shod with rubber tires a friction coefficient of 0.6 between tire and road can be figured upon, the friction co-efficient between a steel car and a steel rail is only from 0.25 to 0.33. Besides, the locomotive must not only propel its own weight but the weight of a train many times heavier than itself.

Frames of the cast-steel bar type are used, and are supported on the driving axles through four double helical springs over the bearing boxes. The driving wheels are of the type with cast-iron centers and steel tires. One of the changes in the U. S. A. locomotive as compared with the stock locomotives is the use of separate connecting-rods from the jackshaft to the further axle and then to the nearer axle, instead of so-called Scotch yoke type connecting-rods connecting the jackshaft with both axles. Brakes act directly on the drive wheels, the brake shoes being of a type similar to those used on steam locomotives, and applied by what is described as an interlocking screw mechanism. The brakes act on all four driving wheels and are operated by a hand wheel in the cab of the locomotive.

Arrangement of Control

There is a seat in the cab at one side, and the operator sits transversely to the direction of motion. To the right of him there are two operating levers, one changing the direction of motion and the other for changing the gear. Coming up through the floor of the cab directly in front of the operator is the clutch pedal. On the front wall of the cab are arranged the different smaller control devices, including the brake hand wheel, the starter button, the throttle lever, the spark advance lever, battery switch and signal switch. The spark and throttle levers operate on a quadrant in the usual manner. No differential is used, but either of the locomotives will readily take a turn of 20 meters radius.

Reference has already been made to the electric starting and lighting systems. The advantage of a self-starter

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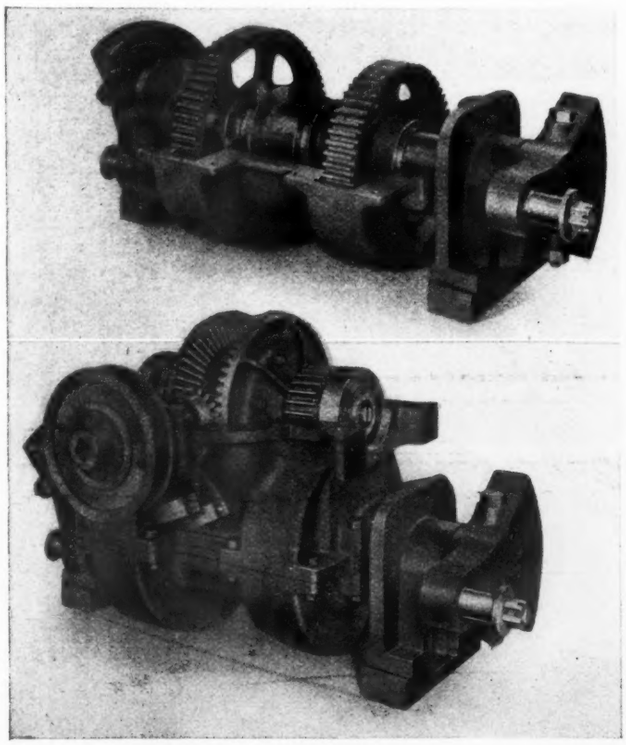
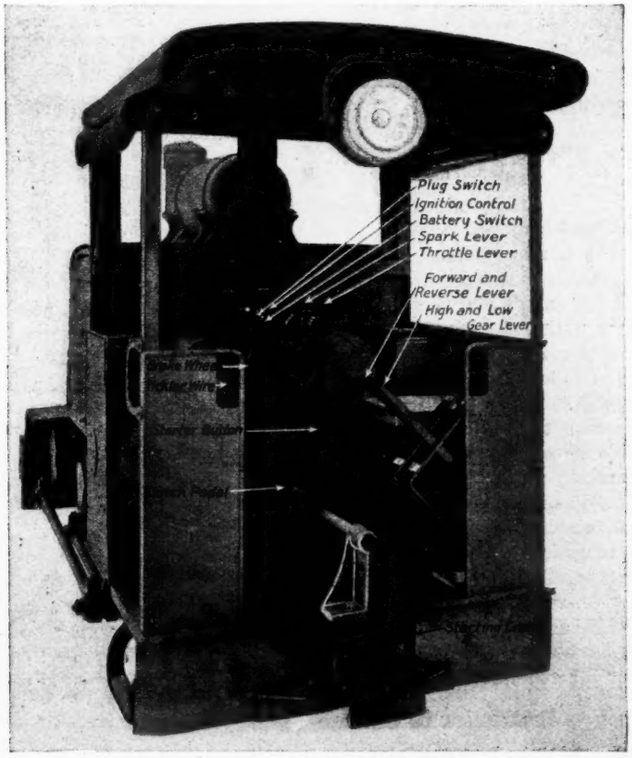


Two views of the transmission, showing the liberal-sized gears



A view of the driver's cab, showing the arrangement of the control devices

Physical Exercises Made Part of Day's Routine

White Company Establishes Gymnasium and Introduces a Program of Daily Physical Exercises for Executive Officers and Department Heads to Conserve Their Health

VIGOROUS physical exercise daily, under the direction of a trained instructor, for the conservation of the health of officials and department heads is the newest plan to promote war-time efficiency. This training is expected to build up the physical endurance of the men so that later on each man may be able to assume added responsibility, if necessary. As adopted by the White Co. of Cleveland, Ohio, the plan applies to the executive officers, superintendents, managers, heads of departments and others on whom rests the responsibility for the solution of important manufacturing and selling problems.

First Industrial War-time Gymnasium

Under the provisions of the new plan, which has been in effect since Nov. 1, the men holding responsible positions spend an hour each morning or afternoon in a spacious new gymnasium which has been established in the basement of the administration building. The men enrolled in the different classes take their exercises on the company's time, and no business appointment or other matter is permitted to interfere with the schedule. The men are required to report at the gymnasium at a specified time under penalty of a heavy fine, and are not permitted to leave until the class is dismissed.

While many other large manufacturing plants have erected pretentious gymnasiums in times of peace for the optional use of their employees outside of regular business hours, the White company claims credit for being the first to start a movement of this kind to improve the health of employees and to make them more efficient in the present crisis.

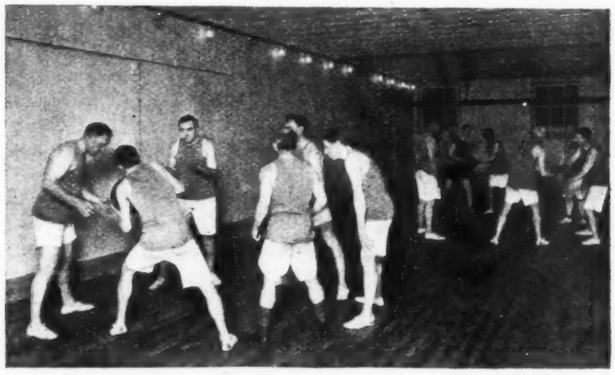
The company points to the fact that members of President Wilson's Cabinet have been taking regular exercise daily under the direction of Walter Camp, and that their program is along the same lines as the plan in effect at the White plant. The Government realizes the great benefit to be derived from regular exercise, and is recommending that all manufacturing and industrial plants set aside fifteen minutes a day to be devoted to breathing exercises and light calisthenics. The American soldiers abroad spend several hours a day in athletic games. Troops landing in France are immediately marched to an athletic field where they participate in interregimental games. This exercise limbers up their muscles after the long journey on the transports.

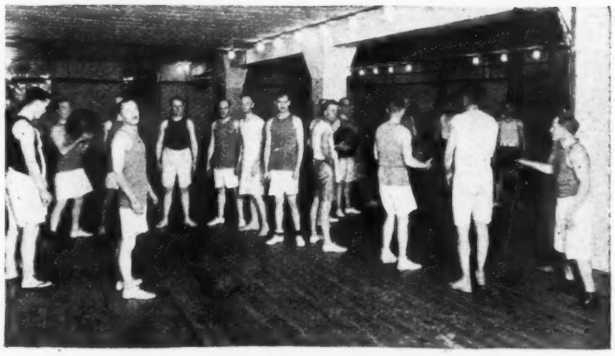
The results of the training, so far, have been gratifying to both the company and the men. The plan may, later, be extended to include all employees.

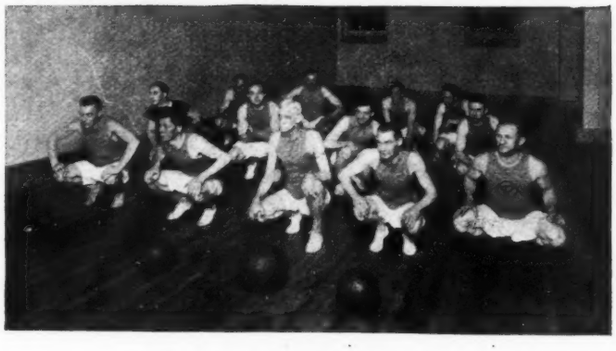
Trained Instructor in Charge

The physical instruction work is being conducted by W. E. Rice, experienced athletic coach and director, who is a graduate of the Chicago Training School and prominent in Y. M. C. A. circles. The course he has outlined for the factory workers consists of passing the medicine ball, setting-up exercises, stall bar work, hand ball, wrestling, club swinging, bag punching and many other forms of calisthenics. Following a strenuous workout in the "gym," the men jump under a battery of shower baths. During the first few weeks there are always many sore and aching muscles; lame backs and stiff joints that require attention.

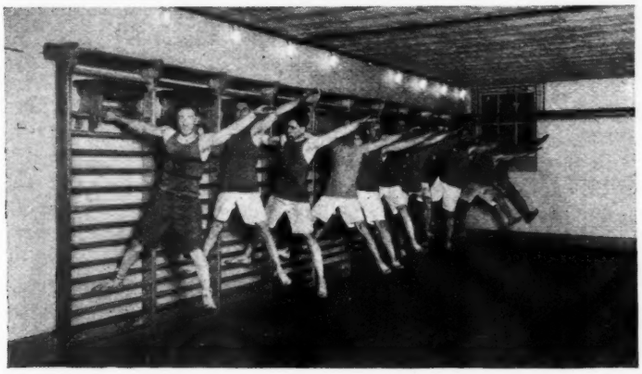
Before entering the class, all men are required to

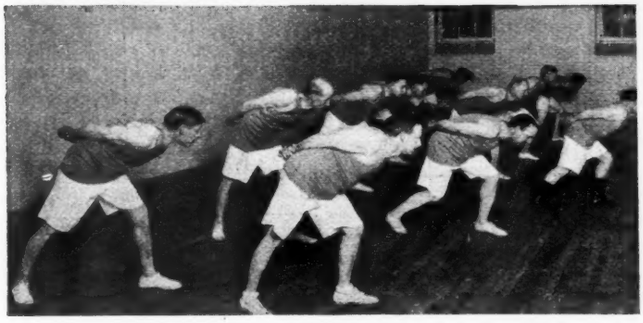






Some of the exercises indulged in





Stall bar work and setting-up exercises

undergo an examination by the company's medical examiner. The doctor makes out a report of his findings and this is filed in the superintendent's office. The examination is repeated regularly every month and compared with the original report. All records are kept.

If a man is found to be nervous, underweight and suffering with some minor trouble he is given medical attention and advised by the physician and physical director as to the proper course to pursue to improve his condition. In many cases a change of diet and the consumption of plainer foods that give greater nourishment have helped materially to remedy the ailments.

E. W. Hulet, vice-president of the White company, who fathered the plan, is highly pleased with the results which have been obtained. He declares that it has created a sense of social equality between the officers of the company and its department managers.

In speaking of the closer relationship between the company and its managers, Mr. Hulet states: "A gymnasium is one of the most democratic institutions in the world. It is a place where men meet on an equal basis and get to know each other more intimately. They are dressed alike, do the same stunts and forget their business cares. It gives them new enthusiasm and a better spirit."

Stout Men Lose Weight

When one of the superintendents, who is 36 years old and weighs 216 pounds, joined the class he experienced great difficulty for a time. He had never done any gymnasium work before. His muscles were soft and flabby and his weight made it almost impossible for him to perform many of the gyrations. It was necessary for him to start in very slowly, but after attending class regularly for a period of ten weeks he is now able to take the regular work assigned. In this time he has reduced his weight 7½ pounds and his waist measurement 1½ in. His chest expansion has increased 2 in., right arm 1 in., left arm ½ in., left and right leg each 2 in. His health was never better and he is now losing from ¾ to 1 pound a day.

While the fat men lose weight under this strenuous daily exercise the thin and underweight men gain. A foreman 47 years old, who tipped the scales at 122 pounds when he enrolled in the class, is now 5½ pounds heavier. Many of his other measurements have increased from 1 to 3 in., and he says that he is getting stronger every day.

Three other members of the class were reticent about taking up the work. One was recovering from a prolonged illness, while the other two suffered with indigestion and stomach trouble. The first gained 13 pounds in weight, the second 7½ pounds and the third 2 pounds. All say that their health is much improved.

Some men who complained of having too large a waist measurement and protruding stomachs have been able to reduce them as much as 2¾ in., and expect to take off a few more inches within the next few weeks.

The following table giving the records of a few members of class No. 1 shows the relative gains and losses. The ages of the men range from 32 to 48 years, and they have been in the employment of the White Company from ten to thirty years.

GYMNASIUM RECORD

	Age 36	Age 46	Age 37	Age 35	Age 42	Age 35	Age 47
Weight (before)	216 lb.	163 lb.	155 lb.	159 lb.	142 lb.	136 lb.	122 lb.
Weight (after)	- 7½ lb.	−6 lb.	+3 lb.	+7½ lb.	−5 lb.	+2 lb.	+5½ lb.
Neck	Same	Same	+½"	+1"	+½"	+½"	+½"
Chest, nor	Same	+1"	+2½"	+1"	+2"	+½"	+1"
Chest, con	Same	Same	Same	Same	Same	Same	+½"
Chest, exp	+2"	Same	+2"	+1¾"	+1"	+2"	+½"
Right arm	+1"	+½"	+½"	+½"	Same	Same	+½"
Left arm	+½"	+½"	+½"	Same	Same	Same	Same
Waist	−1½"	−1"	−1"	−2"	−½"	−1"	−2"
Right leg	+2"	+½"	+1"	+½"	+½"	+1"	+1"
Left leg	+2"	+½"	+1"	+½"	+½"	+1"	+1"

	Age 38	Age 37	Age 39	Age 48	Age 39	Age 32	Age 34
Weight (before)	136 lb.	144 lb.	167 lb.	135 lb.	117 lb.	185 lb.	163 lb.
Weight (after)	+4 lb.	+13 lb.	−10 lb.	Same	+5½ lb.	−5 lb.	Same
Neck	+1"	+½"	+¾"	+¼"	+¾"	+½"	+½"
Chest, nor	Same	+2¾"	−1"	−1"	+½"	+4"	+2½"
Chest, con	+1"	+2½"	−1"	+½"	Same	Same	Same
Chest, exp	Same	+3"	+½"	+½"	+½"	+1½"	+2½"
Right arm	+1"	+1"	Same	+½"	+¾"	+1"	+½"
Left arm	+1½"	+1"	Same	+½"	+1"	+¾"	+1"
Waist	−1"	Same	−2"	−1"	−2¾"	−1"	−2½"
Right leg	+1"	+1"	+½"	Same	+1"	+1½"	+1"
Left leg	+1"	+1"	+½"	Same	+1"	+1½"	+1"

Exhibit for Personnel Managers

PERSONNEL managers who are visiting New York City may find an exhibition devoted to their especial interests on the thirty-fifth floor of the Metropolitan Life Insurance Building. This exhibit is managed by the National Civic Federation, and no charge is made for admission. The purpose is to gather together in one place a vast amount of information on all the problems which are involved in the question of industrial relations. The emphasis of the exhibit is practical rather than theoretical. It shows principally things that have been done, rather than suggesting or criticising policies.

There are several graphic methods by which the industrial relations work of various companies is demonstrated to the observer. One of these is the use of transparencies mounted on stands. The four sides of the transparencies are made of a number of colored glass pictures of industrial relations activities, such as factory restaurants, hospitals and athletics. The walls are hung with photographs of company clubhouses, workingmen's homes and other employment projects adopted by leading companies. One of the best exhibits shows the work carried on by Goodyear. Other large automotive firms are represented, such as Ford and Gray & Davis.

In addition to these illustrations there is a great deal of literature available—pamphlets which may be taken away by visitors, outlining housing projects developed, etc.

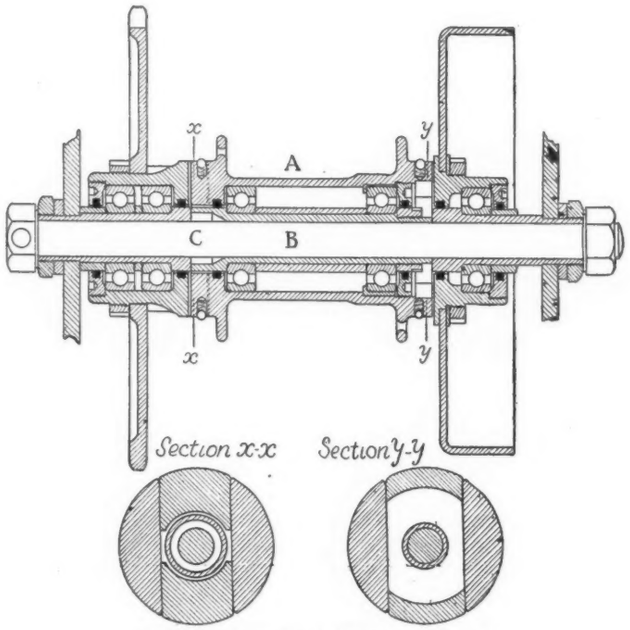
Q. D. Wheel for U. S. A. Motorcycle

Spare Wheel Carried on Side Car Can Be Substituted for Any of the Three Wheels on the Machine in One Minute—A Feature of Great Advantage in Military Work

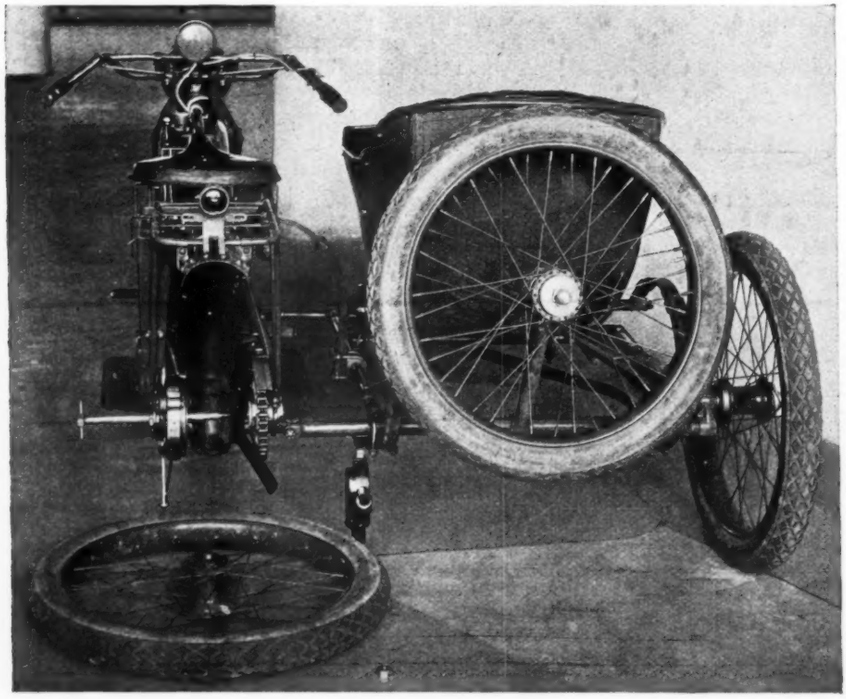
THE most novel feature of the U. S. A. motorcycle that has been developed by the Quartermaster Corps is a demountable wheel which makes it possible to replace a damaged wheel in less than a minute. Heretofore demountable wheels have been used only on passenger cars, but the fact that motorcycle wheels are often damaged in service at the front made it seem desirable to develop a demountable wheel for this work. A spare wheel is to be carried on the side car, and this will take the place of either the driving wheel, the front wheel or the side-car wheel.

The chief problem in connection with the design of such a demountable wheel is, of course, to provide means for the transmission of the driving and braking effort to it. How this has been accomplished in the U. S. A. motorcycle demountable wheel may be seen from the sectional view of the rear wheel hub herewith. It may be pointed out in this connection that all of the bearings used on the wheels of the motorcycle are annular ball bearings, which also denotes a new departure in motorcycle construction, at least so far as American practice is concerned.

There are essentially three parts to the rear hub construction, viz., the central part, which forms part of the wheel; the left-hand part, which carries the driving sprocket wheel and is supported in the left-hand prong



Section through driving wheel hub



Driving wheel removed from motorcycle. Note axle partly withdrawn and rear part of underguard swung upward

of the rear fork, and the right-hand part, which carries the brake drum and is supported in the right-hand prong of the rear fork. The central part consists of the outer hub shell *A* mounted on two annular bearings on the sleeve *B*. The hub shell *A* has an inward flange at one end, and a ring nut is screwed into it at the other end. The flange and ring nut are cut with grooves for felt packing, so as to keep dust out of the ball bearings and retain the lubricant in them. It will be seen that the ball bearing at the right-hand end of the hub shell has both the inner and the outer race clamped tight and therefore will take any thrust loads, whereas the outer race of the left-hand bearing is free in the shell.

Each of the side members of the hub construction also consists of an outer shell and an inner sleeve. In the case of the left-hand part the shell is supported on the sleeve by two adjacent ball bearings, while the right-hand part has only one ball bearing. Attention may be

called to the provision of felt packing wherever there is a chance for dust and grit to work into the interior of the hub.

The driving connection between the central member of the hub construction and the two outer members is similar to that of a Hookham joint. The central member is formed with a tongue transversely across its face at each end, and each of the outer members is formed with a corresponding groove. To prevent incorrect assembly the driving members on opposite ends of the hub are different in form. The whole assembly is held together by means of the central bolt *C*. When this bolt is removed, the central part of the hub construction can be drawn laterally from the two end parts. There is a cross-pin through the head of the bolt to facilitate the removal of same.

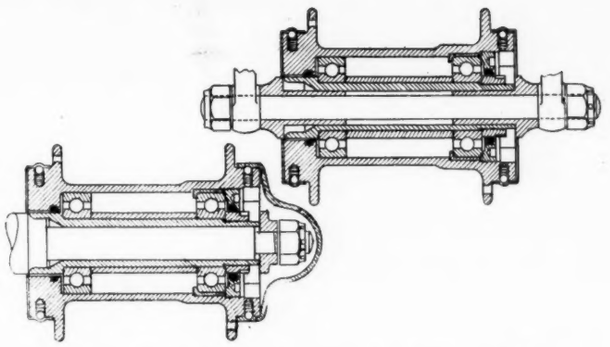
In order to make it possible to withdraw the wheel from the rear fork, it was necessary to hinge the rear portion of the mud guard. If a wheel becomes damaged and the rider wants to replace it with his spare wheel, the first thing he does, if it happens to be the rear wheel, is to drop the stand to raise the machine off the ground. Then he unscrews the nut from the rear hub bolt. The wheel then drops out of its own accord. It is then replaced by the spare wheel, the bolt is replaced and the stand raised to let the wheel down to the ground. The various operations are indicated by the illustrations.

Aside from the hub construction, the new wheel corresponds to the standards adopted by the S. A. E. It is 28 in. in diameter and fitted with a 3-in. tire on a CC clincher rim. There are forty spokes, and these are so laced that there are four crossings. The spoke has a maximum diameter of 0.148 in., and the diameter of the swaged part is 0.120 in. Spokes are made of carbon steel containing from 0.40 to 0.55 per cent of carbon and having a tensile strength of not less than 140,000 lb. per square inch. Each complete spoke and nipple must be capable of sustaining a dead load of not less than 1580 lb.

Inserting the spare wheel

The History of Airplane Dope

A DISCUSSION has been going on in the pages of our British contemporary, *The Aeroplane*, concerning the history of cellulose acetate dope now generally used for treating airplane wing fabric. One of the writers maintains that Dr. G. Austerwiel, consulting engineer of the Astra Co., in 1909 made an investigation into the properties of cellulose and the possibilities of its use for proofing fabric for airplane covering.



Demountable hub on side car axle (left) and front axle (right)

During the following year Dr. Austerwiel, at the plant of the Astra Co., found that by first covering the plane with loom state fabric and then treating this fabric with cellulose solution, the whole of the fabric tightens on the frame work, owing to the contraction of the cellulose film, deposited by means of a volatile solvent; the film firmly adheres to the fabric and possesses those basic properties which now so largely contribute toward the efficiency of modern aircraft. Comparative studies of the properties of cellulose nitrate and cellulose acetate at last led Dr. Austerwiel to use the acetate exclusively.

A statement has been made that Müller during the same year was the first to suggest the use of cellulose acetate in the form of a film for fixing the canvas of airplanes. The invention of cellulose dope has also been credited to Eichengrün of the German Bayer Co. Perhaps the most definite statement that can be made is that in France the use of cellulose dope was originated by Dr. Austerwiel, while in Germany it was originated by Eichengrün. In 1910 Dr. Austerwiel organized the French Emaillite Co., and it was not long afterward that his dopes were introduced in England.

In the first airplanes produced no dope was used. It appears that the first material used for wing covering was rubberized canvas and oiled canvas, these being followed by canvas coated with collodion containing castor oil. Voisin, the well known French manufacturer and pilot, who had been an art student, used the same flour paste which he had been accustomed to use for tightening the canvas on his easel, and he found that fabric so treated did not sag in dry weather as badly as canvas covered with rubber. The success which he attained with this treatment led to the use of other materials, such as gelatine, but all of these were more sensitive to atmospheric moisture than cellulose acetate. In this connection it is of interest to note that the fatal accident of Delagrange was due to the effect of a rain shower on his gelatined airplane wings. A further improvement was due to Henry Farman, who succeeded in partly protecting the gelatine with resinized paper.

The use of cellulose acetate dopes dates from 1910, and they have been the subject of extensive scientific investigation. Nothing can be said regarding recent developments in the technique of aircraft dope, but although much scientific work has been done there is still chance for much further development.

High Price of Flax

OWING to the great demand for flax from which to make linen for airplane wing coverings, the price of this commodity in Great Britain has risen to unprecedented figures. *Flight* reports that at Denby a small amount was sold recently at the rate of £236 per ton. Moreover, the consignment of which this was a part had been damaged by water and was therefore not of the best quality.

U. S. A. Gasoline Locomotives

(*Continued from page* 687)

under war conditions is obvious, as it will greatly facilitate a rapid get-away in emergencies. The starter drive is to a gear ring on the flywheel, through a Bendix drive. From the storage battery current is supplied not only to the starting motor but also to two Golden Glow headlights with 16-candlepower bulbs, one at either end of the locomotive; for ignition and for a warning signal. A set of dry cells is carried for emergency starting and is fully wired up. The cabs are fitted with drop curtains and the cab windows in front and sides are of celluloid instead of glass. Experiments have been made with kerosene fuel, but the locomotives were originally designed for gasoline, and this fuel will be continued for some time to come at least.

The intermediate size of locomotive, which weighs approximately 7 tons and is rated at 50 hp., is equipped with a four-cylinder engine of 5½-in. bore by 7-in. stroke. This model has 30-in. wheels and is capable of hauling a train load of 100 to 150 tons under favorable conditions on the low-gear. All ordinary hauling is done on the high-gear, and the low-gear is used only for accelerating and in pulling exceptionally heavy loads under adverse conditions. This model has a fuel capacity of 30 gal.

In addition to the two locomotives above described, the Baldwin Locomotive Co. is now putting through a larger size rated at 25 tons which has four driving wheels also. The same general types of frame axles, wheels and gears are used as on the smaller locomotives, but the engine is of the six-cylinder type and of 7¾-in. bore by 12-in. stroke. It is also of the Pittsburgh Model make. This locomotive is of standard gage and intended for use on the regular railroad tracks of France. A Leece-Neville starting and lighting system is fitted, and a Zenith double carbureter. The speeds are somewhat lower than those of the two smaller models, viz., 3½ and 7 m.p.h. Driving wheels are 42 in. in diameter. This large machine is fitted with a Westinghouse air brake, in addition to a hand brake, and on account of the considerably greater size provisions are made for changing the gear by compressed air. The air compressor is driven from the end of the engine crankshaft through a roller chain, and air pressure is automatically controlled. The air compressor furnishes compressed air not only for the brakes on the locomotive but also for brakes on all of the cars in the train. This larger size locomotive differs also from the other two models in the location of the transmission, which is under the cab, instead of on the opposite end. The object of this rearrangement of the components is to insure a better balance. This larger model has a fuel capacity of 40 gal. For warning signals the two small locomotives have a motor-driven electric horn, while the large one has a bell and whistle, the latter operated by compressed air.

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Advantages of Steam Outlined

(*Continued from page* 685)

only 40 miles an hour on good roads between points in ordinary conditions to say that if he could get his car on Sheepshead Bay it would average 70 or 80.

The source of this great power is the stored energy in the boiler, represented by 60 lb. of water at a temperature of nearly 500 deg. Fahrenheit, and containing 1,500,000 foot-pounds of available energy. This great potential energy is built up in advance in a form capable of instant use without waiting for combustion to take place. It is one of the secrets of the steam car's matchless performance. Such stored power is obtainable only with the steam boiler of liberal water capacity, or with the electric storage battery. It is quite impossible with any form of internal explosive engine.

This range of power and its application by gearing the engine direct with the rear axle gives that smoothness of propulsion which is the most gratifying characteristic of the steam car which is apparent at moderate speeds and especially during heavy going. It is due to the fact that two double-acting steam cylinders produce a uniform continuous turning moment of the crankshaft. The engine speed is always in an identical ratio to the car speed; and at 60 m.p.h. the engine is running at 864 r.p.m. with 3456 piston reversals a minute, compared with say 2500 r.p.m. and 40,000 piston reversals per minute in an eight-cylinder gasoline car.

Mr. Sturgess referred to the psychological influence of having the control of the steam car centered in a single throttle lever. The single throttle lever suffices to start the car from rest and control the power from zero to 500 per cent above rating. The only thing the steam driver is cognizant of is the speed of the car, and this, with steering, is all he has to think of. Mr. Sturgess gave a picture of the driver of the gasoline car in which he has to give a certain degree of attention to engine speed to the extent of almost complete absorption when starting or in heavy traffic.

With regard to starting the steam car Mr. Sturgess asserted that the general impression that much preparation and considerable time are needed for starting is erroneous. For 98 per cent of the starts steam is ready and the throttle movement is all that is needed. It is only when steaming up from cold, which may not occur once in several weeks if the pilot light is kept burning, which it usually is, that the steam car may be behind the gasoline car in starting. In steaming up from cold from 5 to 10 min. are needed.

With regard to the steam car not freezing in winter weather Mr. Sturgess stated:

"The steam car does not freeze, for the same reason that the building provided with a hot-water heating system does not freeze, but, whereas the building has chilling windows, all susceptible parts of the car are heavily clothed with insulation. Consequently the small pilot always burning maintains the heat. If there is objection to long continued burning of the pilot, a small city gas jet with hose connection with the burner suffices and costs little. Finally, the car may be drained with little effort, or even be permitted to freeze solid with but slight damage and that only to small parts of insignificant cost."

The question of durability of parts in steam cars was referred to as follows:

"Deterioration by age and use of the steam power plant does not appreciably affect the performance of the car. The parts are more enduring, which is due to the slow speed engine completely encased and a few moving parts; to the absence of dust taken into the cylinders; to simplicity of the direct connection to the driving wheels and to the absence of the transmitting devices, including clutch, jointed propeller shaft and gearbox.

"Durability of the boiler is not dependent on wear in the ordinary sense, as it has no moving parts. The normal boiler life is 4 to 5 years."

—

Heavy Fuel Spraying Method

A CARBURETER for the use of heavy fuel, such as kerosene, has been invented by Ralph M. Lovejoy of Boston. The carbureter comprises all of the usual parts of the ordinary gasoline carbureter, including a float chamber with float, primary air inlet and secondary air inlet, the latter controlled by a suction valve. The gasoline feed is regulated by means of a needle valve adjacent to the float chamber, which is interconnected with the supplementary air valve. Secured to the side of the crank chamber of the engine is an air pump, which draws its air from the carbureter near the main air inlet, and delivers it into an air chamber, whence it passes to the mixing chamber of the carbureter just below the mouth of the curved spray nozzle. The idea is that as the liquid fuel is ejected from the spray nozzle, the stream will be struck by a blast of compressed air and will be finely sprayed. The object in drawing the air from the carbureter near the main air inlet is to prevent the amount of air being drawn in to the carbureter from being affected by the action of the pump.

The FORUM

Bad Roads Make Drive-Aways Difficult

By H. W. Glisan

WE have read in AUTOMOTIVE INDUSTRIES and other publications, from time to time during the last 6 or 8 months, of the assistance that motor trucks and passenger vehicles were giving the Government and the country generally in the transportation of merchandise over our public highways. We have also looked at the photographs of the trains of army trucks and of different caravans, including trucks and passenger cars, taken on beautiful stretches of the Lincoln Highway and at other points, both in fair weather and bad, and agreed with you fully regarding the possibilities of the motor truck and automobile in the future. But after all, we reflect, we came to realize how little the writers of these articles really know of the true conditions.

Trucks and automobiles will work wonders in the future, but progress will be woefully delayed unless thorough cooperative support can be secured from the State, Government or highway commissions.

I think it would be well to devote your space to articles which encourage either the State Highway Commissions or the United States Government to build some highways in the States of Pennsylvania, Ohio and Michigan before too much dependence is placed upon the motor vehicle and motor transportation.

Pennsylvania, Ohio and Michigan have spent a wonderful lot of money upon good roads, when their area and population are taken into consideration, but when you are brought face to face with the fact that it is impossible to get from Detroit to Toledo, or from Cleveland to Pittsburgh, after a rain or after a spring thaw, it is easily seen that these vast sums of money have not been spent judiciously.

North-and-South Highways

In States the size of Pennsylvania and Ohio there should be at least from one to three north-and-south highways, or trunk lines, and the same number of east-and-west trunk lines, so that it would be possible for a tourist to get through these States at any time of the year. It seems that all the money has been spent at the centers of population, or roads within a radius of 15 or 20 miles from these centers.

I will venture the assertion that to-night there are at least 500 automobiles and trucks mired to the hubs on the highways of Ohio, and a similar number on the highways of Pennsylvania, requiring in each and every instance a team of six or eight horses to get them through.

Solid trunk lines are the first essential; country roads will later take care of themselves, but as long as this child's play of spending money on good roads in the centers of population is continued the interstate motor truck transportation proposition will be a failure, and the inhabitants of any State having a system of good roads, such as we have in Maryland, can only look upon the good road work of the other States in disgust.

As compared with Pennsylvania and Ohio in population, area and wealth, Maryland is a "bush leaguer," yet it is possible to get to each and every court house in the State on a boulevard, and to get there regardless of weather conditions.

Try to impress the Highway Commissions of these three States, or the politicians, or get the assistance of the Government to put through respectable road systems, and then you can depend on it that the motor transportation of merchandise and other articles will be a howling success.

If the money paid for licenses by the owners of automobiles in the above States were kept as a separate fund, to pay for interest on bond issues and for maintenance cost, it would provide the respective States with ample funds to cover their State with a network of good roads.

This criticism is based on first-hand information, as we have driven at least 250 cars from northern Michigan, covering observation every month in the year, and have promised ourselves over and over again never to attempt to cross one of these States after it has rained, except in an airship, but, of course, necessity compels us to "grit our teeth" and "go to it" as usual each month.

Since writing the above I have been advised, via long distance telephone, by a member of the firm, who is now driving 30 cars in for us, that it required 18 hr. for them to go 12 miles from Unity, Ohio, to Darlington, Pa., and that they were compelled to sleep in a barn.

At the present time road officials will advise you that it is the fault of army trucks, etc.—but forget it; it was practically as bad this time last year.

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Shock Absorbers for Automobiles and Ambulances

(*Continued from page* 684)

to be absorbed, and he thought the best plan would be to start absorbing the energy as soon as the blow was struck. that is, by providing a shock absorber which absorbed energy not only during the rebound but also during the compression. He uses a device in which the force on the spring when in its normal position is very slight but increases very rapidly with the compression. A car cannot be designed for use on one kind of road and at one speed only. If only low speeds were to be used the springs might be made very flexible, but such springs would not give satisfaction at high speeds. The automobile manufacturer is obliged to design his springs to take account of unusual conditions, such as running into potholes in the dark.

Ernst Flentje, of Boston, said that the spring maker faced a very difficult problem when he was asked to provide a spring for seven-passenger cars which should also give easy riding when there were only two or three persons in the car. One reason for the hard riding of many cars was that the scale was not taken off the spring stock as it came from the rolling mills. Before installing his shock absorbers he would take the leaves of a spring apart and grind them on the emery wheel and polish them, then reassemble and lubricate them. This would increase the flexibility about 20 per cent.

Oil Leakage in Hydraulic Shock Absorbers

One of the speakers had mentioned the difficulty of oil leakage in hydraulic shock absorbers, but Mr. Flentje stated that he had positively overcome this trouble. With the hydraulic shock absorber the time element is one of the chief factors. To get correct spring action it is also important that the spring have the right amount of arch. For rear springs he had found it correct to have an arch of 1½ in. when the springs are carrying their normal static load, and for front springs the arch should be 1 in. under the same condition. One of the advantages of a shock absorber of the hydraulic type is that it eliminates about 75 per cent of the skidding.

Mr. Waterman of the Hartford Shock Absorber Co. put in a good word for the friction type of shock absorber. He said that 2 years ago they adopted the semi-universal type of connection at the ends of the shock absorber arms, and that eliminated a great deal of difficulty.

A representative of the Westinghouse Machine Co. gave an explanation of the Westinghouse air spring, which is of the general type of auxiliary springs. The action of this spring was illustrated by a full sized model shown in the meeting room. The principal advantage claimed for this device is that it gives a long range of spring action, and the recoil due to the action of the air spring is effectively dampened.

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Fallacious Reasoning

WHEN we reflect that in the development from the early Otto type stationary gas engine to the Liberty aircraft engine the weight efficiency of internal combustion engines has been increased from 1 hp. for about 2000 lb. to 1 hp. for 2 lb., we must unreservedly admit that wonderful achievements have been recorded in this field. The inventors, the engineers and the designers who have devoted their talents to the problem of improving these engines with such signal success are certainly deserving of much credit.

While the above figures would suggest a close approach to finality, leading authorities agree that there is still much to be accomplished, and especially in connection with airplane engines it is highly desirable that the weight of the engine be further reduced and its fuel economy be improved. The present imperative need for improvement along this line affords unprecedented opportunities for inventors, but those who would profit from these opportunities should realize that for nearly half a century a great amount of engineering and inventive talent has been concentrated upon this very problem and that, consequently, the solution cannot be expected to be an easy one. It is also unreasonable to look for improvements which will halve the weight or the fuel consumption in a single stroke; rather will progress be achieved gradually step by step.

To do effective inventive work in the internal combustion engine field it is necessary first of all to have a clear conception of the working principles of the engine. We have had repeated examples of the ridiculous results arrived at by inventors lacking a grasp of these principles. Thus some years ago an inventor of a small agricultural engine of the double piston type reasoned as follows: In the ordinary engine, when the explosion occurs in the combustion chamber there is a certain pressure on the piston head and this pressure causes the piston to move and produces power, but there is exactly the same pressure on the cylinder head and this pressure is absolutely wasted. In my engine I put another piston in the place of the cylinder head, which I connect up to the crankshaft. Thus I utilize the pressure which is otherwise wasted against the cylinder head and double the power of the engine.

We are reminded of this modest claim by a circular of a rotary combustion engine which has just come to hand. This engine is said to be without "an atom of reciprocating motion," and this feature is alleged to be the secret of the wonderful characteristics claimed for it. The circular is gotten up in true Colonel Sellers style, explaining that in an ordinary reciprocating engine making 1000 r.p.m. each piston comes to a dead stop 120,000 times per hour and in a six-cylinder engine there are 720,000 stops. Think what this means! "It takes power to stop that piston as well as to move it, therefore you have lost power."

The calculation of stops is absolutely correct, but the premise that it takes power to stop the piston is the direct opposite of the truth, for when an engine piston comes to a stop during the last half of its stroke it delivers up energy instead of consuming it. But to the unsophisticated reader the statement sounds plausible, and it would not be at all surprising to see many an unwary investor ensnared by the seductive invitation "to get in on the ground floor."

Tests of Spring Action

WE are all quite familiar with the laws of statics, that is, the laws determining the actions and reactions which occur when forces are applied to bodies which remain at rest. But when it comes to dynamics, the laws of bodies in motion, it is quite a different matter. The simplest cases of forces applied to bodies in motion can be dealt with by mathematics, but many of the problems that come up in practical work are of such a complex nature that mathematical treatment does not lend itself to them. This applies to the deflections produced and stresses set up in chassis springs by irregular road obstructions. There has been a good deal of mathematical writing on spring action, but this generally has been based on the assumption of obstructions of simple geometrical form absolutely rigid in shape and in support. Needless to say, such obstructions

are met with very rarely, if at all, in practical work.

The difficulties encountered in discussing spring action were well illustrated at a recent meeting devoted to an engineering discussion of shock absorbers. The question was raised what would happen if a spring was struck a blow of 200 lb. and before it had time to recover it was struck another blow of the same intensity. There seemed to be a division of opinion as to whether or not the second blow, being no heavier than the first, would cause a further deflection. To eliminate this uncertainty one of the speakers suggested to make the second blow equal to 400 lb., in which case there would be no question but that the spring would be further compressed.

What is wrong with the above proposition is that a blow cannot be measured in terms of pounds. A blow represents the release of a certain amount of energy and can only be expressed in foot-pounds. When the blow struck is light as compared with the mass of the body it may be taken up in causing an elastic or a plastic deformation of the body. A heavier blow struck a body which is free to move in any direction will cause the body to move in the direction in which the force of the blow strikes it. If the body struck is already in motion, then the blow will either accelerate, retard or change the direction of the motion, according to the directions of the original motion and of the blow and to the kinetic energies of the moving body and of the blow.

Records of Spring Play

We have listened to many discussions of the merits of various systems of springing and shock prevention, and as a rule these discussions never lead to any definite conclusion. Tests made often also lack practical value, as the records are of such a nature that it is impossible to correctly interpret them in terms of riding comfort. It has been seriously suggested to trace a curve of the relative motion between frame and axle and to judge the effectiveness of the springing by the approach to smoothness of the line thus traced. To show the fallacy of this reasoning it is only necessary to point out that a car with the springs blocked up would give a perfectly straight line by this method.

Probably the most rational method of recording the action of the springing system would be by the use of an instrument based on the accelerometer principle. It is not the amplitude of spring action that causes discomfort, but rather the suddenness of the action; in other words, the rate at which the body is accelerated in a vertical direction.

As there can be no better proof of a pudding than the eating, so there can be no more conclusive test of a springing system than a trial under practical conditions. Still, the results of such a trial cannot be set down in actual figures, and for the sake of comparison and to make it possible to convey an accurate idea of the riding qualities of different springing systems to people not in position to make a test themselves, it would be highly desirable if we had a standard method of spring action test based on a rational principle.

Abusing Specifications

THE writing of specifications for many aviation parts, which specifications call for special alloy steels and special heat treatments, is causing serious delays in not a little of the war program. These specifications are written by engineers or metallurgists who know steels and their characteristics, but often do not understand the uses to which many of the parts are to be put. For example, special alloy steel bolts are being specified in airplane parts where the work is holding one piece of wood to another and the bolt thread is so strong that the washer and bolt head can be literally drawn through the wood. There have been delays in production because such bolts have not been available when needed. Other bolts that were immediately available would have served, but it was not permissible to use them.

There has been much delay in aviation production due to a lack of knowledge on the part of the maker as to where the part has to be used. The manufacturer gets the blueprints, the material specifications and heat treatments, but is not advised where it is to be used or the loads it has to carry. Were he given a semi-intimate knowledge of the place the part is to be used he could in many cases furnish the same parts with other specifications which would be entirely satisfactory and could be delivered in quick time. In these days when production of parts is the one object to be gained the physical tests should suffice for certain parts and no attention given to elaborate specifications that perhaps do not give any better results.

Inspection Another Trouble

Still a further trouble with production is that of inspection, a percentage of which is not so intelligent as it should be. There are many inspectors who are not familiar with aviation, and many others who never worked in a factory. They have not that desirable discrimination necessary when inspecting a part for manufacturing limits to insist on accuracy in such parts as a bearing where the slightest variations must not pass, and those other parts where similar variations do not interfere with the work. That good manufacturing and engineering judgment is lacking and invariably causes precious and factory racking delay. It is not surprising that some factories are having difficulty with certain of their employees working on aviation work, a condition due largely to the unsatisfactory inspection systems.

But the trouble is not always entirely with the inspectors, because many of them are inspecting parts that they have not the slightest idea where they are to be used. They go entirely by the blueprint and the instructions given thereon. Intelligent inspection of such work is almost impossible. Inspection difficulties are bound to continue and it may be that the worst is already over, but manufacturers can generally assist very materially by working with the inspector rather than putting difficulties in his way.

□ Latest News of the

Liberty Engine Commended by Marshall Airplane Report

Government Red Tape Blamed for Deplorable Delays in Production—Changes Already Assure Elimination of Delays

WASHINGTON, D. C., April 3.—The Snowden and Marshall investigating committee appointed by President Wilson to report on the airplane situation, and which committee has made a complete circuit of the airplane factories in its investigation work, has a report ready. While the complete text of this report is not available, the general tenor of it is understood to contain recommendations which will eliminate the red tape of the Government which has been largely responsible for the deplorable conditions in aircraft production to-day.

The report shows that airplanes are being turned out in satisfactory quantities, and there are indications that production in the near future will meet all public expectation. The Liberty engine is upheld as a complete success in the field for which it was designed. As reported in other parts of AUTOMOTIVE INDUSTRIES this week, the report will tell how Great Britain is eager to secure Liberty engines, and so great is this eagerness that arrangements are being made to export the parts and have them assembled in England.

The report will show that the parties responsible for the failure to date in the aviation program were largely interfered with by Government red tape, and will recommend a simplified system of production which will eliminate official interference and suggest the creation or placing of greater power in the hands of the civilian heads of the airplane program.

It appears that as a result of Mr. Marshall's visits at the airplane factories that he was amazingly pleased with what has been accomplished in the different factories visited, and it is understood he visited Wright-Martin, Curtiss, Packard, Cadillac, General Motors, Lincoln Motors, Marmon, Dayton-Wright, Ford and Fisher body and several other plants.

As a result of this investigation, the report not only praises the Liberty engine design, but also praises the tooling up for its production in the factories, as well as the general factory equipment for production of aviation engines, which has never been accomplished in any country before this time.

Not only does the report approve of the present arrangements in all of the factories for the production of Liberty engines, but it also approves of what has been done in the production of other types of engines up to the present time.

The Marshall committee is of the opinion that there is no necessity for an Air Ministry or an Air Board such as used in England and France, but believes that for the present the civilian Aircraft Board can accomplish all that is desired, provided it is not hampered too much by red tape. At present this civilian Aircraft Board can only make recommendations, and cannot take action without the approval of the officers of the Signal Corps and the War Department. It seems to be this red tape that has so seriously interfered with airplane production to date.

As a result of the investigation the report is current here that steps have already been taken to abolish the red tape which up to this time has tied the hands of manufacturers engaged in aviation work. It is believed that good results have already followed.

What disposition President Wilson will make of the Marshall report is not known, but it is possible that a special report containing the recommendations of the committee will be issued by him, and such should have a very reassuring effect on the country.

Just at the time this report is coming out rumors of difficulties in connection with aircraft work are current. It is known that the production of planes has been delayed because of wing beams, that is, the large piece of wood which forms the main support of the wing. This shortage has been due to superinspection, in that Government inspectors have refused to pass much material for these wing beams which would have proved entirely satisfactory.

This spruce for these wing beams was approved by Government inspectors in the spruce forests of the West, but when it arrived at the airplane factories east of the Mississippi it was rejected by other Government inspectors. In some of the airplane factories this rejected material has been carefully stored in special buildings erected for this purpose, and the manufacturers feel confident that within a month this material, which is entirely satisfactory, will be passed by the Government inspectors at these factories. Should it not be passed by these Government inspectors, the production of planes will continue to be greatly hampered as it has been in the last month.

There have been many other delays in the shipment of materials, which delays cannot be laid to the manufacturers, but rather to Government officials. There have been consignments of spruce which, while explicitly ordered to be shipped to certain factories from the spruce regions of the West, have been shipped to other factories. On reaching these other factories there have been long delays in order to get reshipment made, so that a month to six weeks' precious time has been wasted by this carelessness, which has not in any wise been due to the manufacturer.

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Consular Invoice for Cuban Shipments

WASHINGTON, April 3—The Post Office has announced that it is necessary to provide a consular invoice covering merchandise valued at more than $5.00 for delivery in Cuba. The invoice must be presented at the Cuban Consular office except where they are mailed at a U. S. Post Office where no Cuban consular office is located. This announcement is made because of the mistaken belief that an invoice is unnecessary provided a customs declaration is attached to each package.

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150 Liberty Engines Shipped

WASHINGTON, April 4—One-hundred and fifty Liberty airplane engines were shipped abroad last week, and more than seventy have already been delivered, ready to be installed in planes. This information was given out as the reply of the Aircraft Board to the charges that only 37 would be ready by July.

Automotive Industries

Favor Pooling Motor Transport Activities

Truck Makers Seek Information on Quantity of Vehicles Government Will Order—Airplane Situation Little Changed —Fuel Committee to Meet Soon

WASHINGTON, April 2.—The vital question here to-day is what government business for trucks will be placed the coming year. The truck makers, unable to learn just what demands will be made upon them, are unable to place their contracts for materials, to know what organizations they will need, or to what extent their normal business will be affected. There have been several indirect complaints to high officials, and there may be some important action within the next few days. The reports that the contracts for A and AA standardized trucks are held up because the Government has overordered are not correct. The only reason behind the delay lies in the uncertainty of control of these trucks.

For several weeks the General Staff of the U. S. Army has been in favor of pooled motor-transport activities similar to the plan used by General Pershing, and described in these columns recently through an interview with Major Barrett Andrews. However, the General Staff has been unable to decide how it will proceed in its centralization. For one hour recently a General Staff order placed all truck work under Colonel Moody in the Ordnance Corps. This action was quickly reversed for reasons not made public and the normal status resumed.

Motor Transport Under One Head

Now it appears as if all motor-transport operations will come either under the Quartermaster Department or will be taken from each of the various army corps and placed under a new department operating directly under the General Staff, as with the Medical Corps, Engineering Corps, etc. This last plan is gaining considerable favor, as it is one method that will abolish the existing departmental jealousy; and further, because the motor transport work is sufficiently important to entitle it to complete separate attention. In connection with a new department of this sort Christian Girl's name is mentioned as the possible head.

At any rate, there must soon be some action taken, for any further delay is going to create an unpleasant situation when the Government places its orders and finds the truck makers in no position to handle them. For example, the Ordnance Department is now considering the placing of contracts for 20,000 F. W. D. and 12,000 Nash trucks, and truck makers who would prefer to handle the A and AA work are puzzled, and do not know whether or not to bid on the ordnance jobs.

Airplane Situation Unchanged

The airplane situation remains about the same, with many rumors current. One is to the effect that the Snowden Marshall committee's report is very favorable. Another states that the aircraft operations are to be taken from the Signal Corps and placed under a new separate division under the General Staff, much like the plan for the standardized trucks. Resolutions are said to be drafted and ready to be placed before Congress by aeronautical organizations calling for centralized authority over all airplane matters. At present, Howard E. Coffin acts only in an advisory capacity. His recommendations go to the Signal Corps, and may be carried out or killed according to the view taken there. Again, there are the various differences of opinion between the complete Aircraft Board, the Navy and the Army, with no actual centralized authority anywhere.

The Fuel Committee of the National Automobile Chamber of Commerce, headed by W. C. Durant, is to have another meeting with the Fuel Administration soon to decide upon the fuel allowance and further curtailment of the industry for 1918-1919. This meeting was to be held early in April, but it was wisely postponed until some time in May because of the present heavy German offensive, which it was thought might influence a heavier curtailment if the meeting were held now.

Summing up Washington automotive conditions, it can be stated that the activities at present are less than during the fall of 1917. There are many fewer men of the industries here now, and those who are here have found things more or less stagnant. The indications, however, point to an increase of important events with the placing of new contracts, the centralization of motor-transport operations, and the settling of the present airplane situation. The present quiet atmosphere is displayed by the long absence of H. L. Hornung of the Automotive Products Section, War Industries Board, who has been absent for several weeks; Christian Girl, chairman of the Motor Transport Section O. Q. M. G., who has been away for the past several days; and by the frequent absence of Hugh Chalmers, A. W. Copland, and many others who recently were extremely busy here.

There has been a persistent rumor here, denied emphatically by army officials, to the effect that Secretary of War Baker will remain in France, and be succeeded here by Major General Goethals, at present acting quartermaster general. Such action would have an important effect on automotive matters. Secretary Baker has expressed himself energetically in favor of standardized trucks, airplanes, motorcycles, etc. General Goethals, according to reports, is less inclined to this viewpoint, and would probably be more inclined to favor the use of existing vehicles and facilities. The rumor may or may not be true. It has been heard daily since Secretary Baker left. At the same time, the Secretary is now announced as nearing Italy and making ready to return home.

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Regulations for Industry Tracks

WASHINGTON, April 3—W. G. McAdoo, director general of railroads, has laid down several requirements for tracks used by factories. The industry must pay for and maintain, except in special cases, and the railroad shall own that part of the track from the clearance point to the right-of-way line. If the industry fails to keep this in a reasonably safe condition, the railroad company may disconnect the track. Existing tracks, except those covered by special written contracts, follow the foregoing provisions.

First Liberty Truck Convoy Arrives

Makes Trip Without Mishap—Carries Forty Tons of Spares—Quick Journey

BALTIMORE, March 29—The first convoy of Liberty trucks arrived here at noon to-day from Lima, Ohio. Twenty trucks and 3 passenger cars with a company of 42 men comprised the convoy. An additional 10 trucks left Lima with the convoy, but turned from the Eastern Highway toward Fort Sherman, where they will form a part of the motor transport equipment. The 20 trucks now temporarily stationed at the Mechanical Repair here will go forward within a day or two to Camp Devens, Mass.,. and to Camp Meade, Md., each camp securing 10 of the trucks.

The journey overland was decidedly successful. Owing to a misunderstanding, the trucks were cleared from Lima without extra repair parts, but the trip was negotiated successfully despite this. Each truck weighed 10,570 lbs. and sixteen of them carried an average of 17.-000 additional pounds in the form of 50 tons of cases of Garford spare parts. These were originally scheduled for freight shipment to the Baltimore repair depot, but owing to freight troubles it was decided to send them on with the convoy.

The entire journey took 8 days, the convoy leaving Lima Thursday noon, March 21, and arriving here at noon today, covering practically 600 miles at an average of 70 miles per day. No serious troubles developed on the trip. Some minor adjustments were necessary, such as cleaning of a carbureter, changing of spark plugs and so forth, but nothing developed that would indicate a fault in the mechanism.

The men of the Liberty truck company did their work before retiring, thus making ready for early morning starts, while the men of the Michigan company worked early in the morning at cleaning, adjusting and so forth and thus lost time.

A fuel consumption competition was also inaugurated by Captain Price, who had charge of the convoy, and this further stimulated the drivers to their best efforts. The trucks averaged 4 miles per gallon except in a stretch of heavy mud, where the consumption was cut to slightly below 3 miles per gallon. It was in this mud stretch that Captain Price and his company showed its mettle. The Michigan convoy used tractors here to pull its trucks through, and finally shipped many over a short railroad detour. The Liberty truck convoy negotiated the stretch without serious trouble.

One of the trucks was used as a mess wagon and carried the stove and eating utensils that provided meals for the men when it was not possible to reach a town at meal time. The Red Cross provided excellent food in most of the cities and each night as the convoy made its stop the city selected turned over the town hall or some other large quarters where the men pitched their cots.

The cities used for night stops on the journey included in the order named: Fremont, Ohio; Bedford, Canfield, Darlington, Greensburg, Pa.; Stoyestown, Everett, Chambersburg, Baltimore. The trip from Chambersburg to Baltimore, through Gettysburg and Westminster, to the camp at Baltimore, a distance of 100 miles, was made between 3 a. m. and 1:30 p. m.

Low speed was never resorted to in the entire journey, second sufficing in all instances to make the grades. The chief trouble was with stiff engines, all of the trucks when first leaving Lima displaying such stiffness that towing was resorted to. By the end of the seventh day this stiffness had disappeared, however, and each engine was operating in excellent condition. No night traveling was done, the evenings being used for making adjustments, cleaning trucks and so forth, with starts at early morning.

The line-up of 30 trucks in Lima, Ohio. Twenty went to Baltimore and ten left the convoy to go to Fort Sherman

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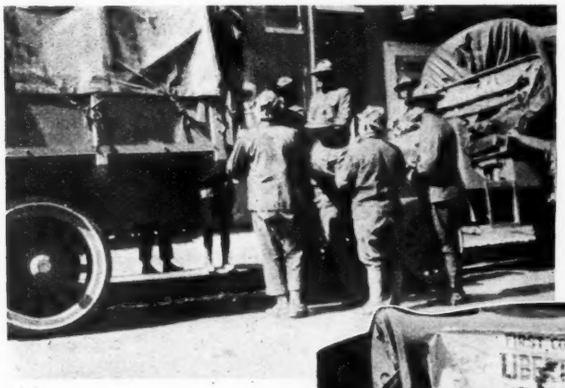
Cleveland Return Load Lagging

CLEVELAND, OHIO, April 1—The developments of the return load bureau idea in the state of Ohio is lagging, especially in the city of Cleveland, where nothing has been done to organize such a bureau, and prepare the trials necessary for its successful operation. Although the Ohio Defense Council held a big meeting at Columbus, Ohio, on March 8, at which it outlined a very comprehensive plan to inaugurate return load bureaus in all of the large cities in the state, including Cleveland, Cincinnati, Sandusky, Springfield, Youngstown, Mansfield, Canton, Toledo, Akron and Dayton, nothing has been accomplished on the work so far in the largest city, Cleveland. This has been partially due to the resignation of B. S. Hurd, formerly traffic manager of the Cleveland Chamber of Commerce.

Views Along the Route of the Liberty Truck Convoy

The convoy lined up on one of the streets at Westminster, Pa.

A panoramic view of the convoy as it neared Baltimore



One truck served as a mess wagon, carrying food and cooking utensils

On the sides of some of the trucks were signs which read "On the Way to Berlin"

The head truck in Company 301, in which there are 100 trucks

The drivers were always very careful of their trucks, even cleaning them en route

Exports Smallest in Years

Fewer Shipments in February Than in Any Month Since February, 1915

Mos.	Cars	Value	Trucks	Value	Parts
Feb.	3,551	$3,078,191	765	$1,917,638	$1,962,979
Jan.	4,325	3,841,871	1156	3,328,870	2,665,278
			1917		
Feb.	3,939	2,852,308	784	2,128,665	1,916,113

WASHINGTON, April 3—Exports of automobiles, trucks and parts during February amounted to $6,958,808, 41 per cent less than the January amount and 9 per cent less than the February, 1917, amount. This is the smallest amount that has been exported in any one month since February, 1915.

There were 674 less passenger cars shipped in February than in January, and the value decreased more than $700,000. Truck shipments declined from 1156 in January to 765 in February, and the value decreased 45 per cent. Fewer parts were shipped.

Much of the decrease in the number of passenger cars shipped is due to the fact that British South Africa, Australia and New Zealand bought only a small percentage of their customary amount. In January Australia's shipments of passenger cars totalled 931, as compared with 144 in February. New Zealand bought 221 in January and 110 in February. British South Africa bought 231 in January and 31 in February. Canada's total of cars increased, on the other hand from 692 to 919.

There were few trucks shipped to the Allies last month. France's quota was only 86 as compared with 662 the month before, and none was sent to the United Kingdom. Canada led in the number of trucks bought, with a total of 420, more than all the other countries put together.

The United States imported two cars during the month, and 35 cars since June, 1917.

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Priorities for War Material

WASHINGTON, April 3—A Requirements Division to establish priorities of delivery in war materials was established yesterday. The division will eliminate competition among government departments in obtaining supplies. The agency is headed by Alexander Legge. Other members are: Judge E. B. Parker, priorities; George N. Peek, finished products; J. L. Replogle, steel; Director Gifford, Col. George H. Estes, Rear-Admiral Peoples, F. A. Brown of the Emergency Fleet Corp., T. C. Powell, railroad administration, P. B. Noyes, fuel administration and James A. Carr, of the Allied purchases commission.

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Texas Dealers Have Second Convention

SAN ANTONIO, TEXAS, March 28—The second annual convention of the Texas Automobile Dealers' Assn. was held here last week. Officers were elected as follows for next year: President, F. A. Weinrich, San Antonio; vice-president, Roy Munger, Dallas; H. H. Bryant, San Antonio; George Conant, Houston; treasurer, W. F. Rose, Dallas; directors: W. G. Langley, Dallas; Hob Diggs, Fort Worth; H. L. Miller, San Antonio, and P. G. Stokes, Big Springs.

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Dodge Buys Wilt Plant

DETROIT, April 2—John F. Dodge, of Dodge Brothers, has purchased the site and factory building of the Wilt Engineering Co. The price paid is reported to be $115,000.

Labor Problems of the War

Conference of Industrial Engineers and Western Efficiency Society Meets in Chicago

CHICAGO, April 3—Efficiency experts have decided that the time has come for women to do the work of men after making an exhaustive study of American needs and resources, according to information presented at the conference on "Labor Problems Under War Conditions" now being held here under the joint auspices of the Society of Industrial Engineers and the Western Efficiency Society.

A woman can work, without harm to herself, as a taxi driver, chauffeur for a car or truck, factory employee in certain lines of work, as well as an elevator operator, waiter and hotel and club porter, Pullman car conductor and porter, or office worker. All of these must be undertaken by women at once. Boys and girls from twelve to sixteen years old should have jobs part of the time. Enemy aliens should work under armed guards, on roads among other things. That these steps are necessary was set forth by C. E. Knoeppel, New York consulting engineer and efficiency expert in his address last night.

The Government is considering women as workers even in lines which now are classed as military or semi-military occupations, according to the statement of Miss Florence M. King, president of the Woman's Assn. of Commerce of the United States. As president of this organization Miss King has had inquiries from the Government as to training women to be inspectors of war materials.

Exports of Automobiles, Trucks, Airplanes and Parts for February and 8 Previous Months

	February				Eight Months Ending February			
	1917		1918		1917		1918	
	No.	Value	No.	Value	No.	Value	No.	Value
Airplanes	4	$40,392	5	$31,155	24	$280,414	18	$192,620
Passenger cars	3,939	.....	3,551	.....	37,470	75,583,705	37,592	77,794,187
Commercial cars	766	1,979,965	765	1,917,638	10,897	30,780,184	9,171	24,827,936
Parts, not including engines and tires	.....	1,916,113	.....	1,962,979	.....	16,600,082	.....	21,298,503
Airplane parts	.....	61,690	.....	633,552	.....	1,231,363	.....	4,740,247
Motorcycles	.....	.....	608	152,811	.....	.....	6,897	1,482,870

BY COUNTRIES, 1917-1918

	Passenger Cars		Trucks		Passenger Cars		Trucks	
Denmark	.....	.....	.....	.....	.....	.....	.....	.....
France	30	45,370	86	424,977	710	809,878	2,093	7,637,208
Norway	.....	.....	.....	.....	89	94,066	.....	.....
Russia in Europe	.....	.....	.....	.....	492	1,136,400	.....	.....
United Kingdom	88	274,788	.....	.....	695	1,429,695	.....	.....
Canada	919	655,549	420	1,164,308	7,674	5,724,025	4,477	12,326,576
Cuba	128	159,396	87	81,701	2,369	2,225,006	573	712,265
Argentina	335	271,294	.....	.....	2,875	2,046,772	.....	.....
Chile	199	235,967	.....	.....	2,809	2,775,150	.....	.....
British India	.....	.....	.....	.....	32	28,602	.....	.....
Dutch East Indies	68	71,627	.....	.....	1,205	1,232,116	.....	.....
Russia in Asia	.....	.....	.....	.....	5	8,425	.....	.....
Australia	144	119,790	.....	.....	3,138	2,436,994	.....	.....
New Zealand	110	95,941	.....	.....	1,370	1,066,333	.....	.....
Philippine Islands	162	145,367	.....	.....	924	805,645	.....	.....
British South Africa	31	29,213	.....	.....	1,740	1,363,663	.....	.....
Other Countries	1,337	973,889	172	264,652	11,465	8,459,976	1,642	2,630,584
Total passenger, commercial and parts				6,958,626	37,592	77,794,187		

AUTOMOBILE IMPORTS

Cars	2	450			35	35,978		
Parts, except tires	.....	3,983			.....	62,973		

Mr. Knoeppel made his first report on the results of questionnaires sent out to 1000 manufacturers, labor leaders, industrial engineers and economic experts. Seventy-five per cent was to manufacturers. The conclusions drawn by him are based on conclusions from this questionnaire and from personal study. Some of these conclusions are that women are needed in industry; that organized labor has nothing to fear from women in industry as proved by present employment; that women should have equal pay for equal work; that man power should be utilized to the fullest degree before calling on women in the heavier industries.

"Women in Industry—Replacing Men" was the subject of both afternoon and evening sessions yesterday, and this morning was devoted to a similar subject.

The closing event of the National Conference was the banquet on Friday evening. The speakers of the evening were James O. Craig, president of the Business Men's Clearing House, who spoke on "The Shifting of New Man-Power to Emergency Production"; Montague Ferry of the Engineering Department of the Armstrong Bureau of Related Industries, whose topic was "Team Spirit in Industry"; C. E. Knoeppel, New York, who talked about the probable relations of capital and labor after the war; and F. A. Carlisle, president of the Western Efficiency Society.

Wrong Distribution of Executive Ability

The point which Mr. Craig emphasized most strongly was the probability that many of the snarls in production which have aroused the criticism of the country have been due to a wrong distribution of the country's executive ability. Men of superlative ability in their particular lines, under the urge of patriotic duty, are occupying subordinate positions at Washington, included in the $1 a year class, and are making more or less perfunctory reports to superiors who have no first hand knowledge and no special ability in handling the matters which come up to them. This Mr. Craig characterized as economic waste and a detriment to the productive industries of the country.

Mr. Knoeppel sounded a warning to capital, by insisting that the war was destined to bring about changed relations between capital and labor by showing the latter its strength and by producing such conditions that this fact will demand recognition. War is wiping out the barriers which have persisted hitherto between employer and employee and after the war they will meet upon an equality which will necessitate revolutionary changes in attitude.

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Price Increase on Ford Parts

DETROIT, April 2—Contrary to the rumors that the Ford Motor Co. contemplates the decreasing of prices of parts, it is stated by the company that prices have advanced on a dozen different units. The price increase became effective April 1.

American Cars in New South Wales

Australian Province Imports Majority of Cars and Parts from the United States

SYDNEY, AUSTRALIA, March 15—About 75 per cent of the automobile chassis and bodies, 90 per cent of the motorcycles, and 80 per cent of the rubber manufactures imported by New South Wales, are manufactured in the United States. Although imports in general decreased during 1917, the percentage sent from America increased.

Motor car chassis worth $1,959,325 were imported in 1917, of which $1,555,354 worth came from this country. Body imports totaled $499,593, and of this figure, America's contribution totalled $456,593.

The same is true of motorcycles and rubber manufactures, all other countries being almost negligible factors at present.

Canada is the strongest competitor of the United States. The value of chassis shipped from Canada to New South Wales during 1917 was $181,265, less than half of the 1916 amount. In 1917, the number of chassis shipped by the United States was only slightly less than the 1916 amount.

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6100 Attend Chicago Used Car Show

CHICAGO, April 3—During the first 3 days of the Exchanged Car Show, 72 cars were sold, compared with 75 during the same period last year. The attendance was 6100, an increase over 1917.

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Wright Aeroplane Buys Plant

WINCHESTER, IND., April 1—The Union City Body Works has been taken oves by the Wright Aeroplane Company of Dayton, O., and will be used for the manufacture of airplane parts. About 250 men will be employed at the plant. Work already has been started on government contracts.

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Stutz Wage Increase

INDIANAPOLIS, April 1—The Stutz Motor Car Co. recently increased wages of all employees of the factory 10 per cent.

A vote of the employees was taken to ascertain if they favored a nine or a ten hour day, and a majority of the men voted for a ten hour day. After this vote was taken Mr. Stutz decided on a nine hour day with no work on Saturday afternoons, making a fifty hour week.

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Noble Heater to Start Production

KENDALLVILLE, IND., April 1—The Noble Heater Co. of Kendallville, Ind., incorporated recently with a capitalization of $400,000, will start production in the near future of an automobile heater, the patent of G. A. Bartholomew, one of the incorporators.

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Ford Contracts for Airplane Sheds

DETROIT, April 2—Several new contracts have been awarded by the Ford Motor Co. for the erection of airplane factories. These will be used as testing sheds.

Imports Into New South Wales, Australia

Country of Origin	1916	1917
Motor Car Chassis		
United Kingdom	$211,784	$140,985
Canada	377,758	181,265
Austria	62	.....
Belgium	1,330	.....
France	100,054	13,179
Germany	779	3,776
Italy	111,236	64,766
U. S. A.	1,918,639	1,555,354
Sweden	323	.....
Switzerland	4,209	.....
Total	$2,526,474	$1,959,325
Bodies		
United Kingdom	$25,166	$10,008
Canada	80,200	30,196
Belgium	428	.....
France	12,963	500
Germany	185	157
Italy	6,232	1,739
U. S. A.	604,404	456,993
Commonwealth	157	.....
	$239,754	$499,593
Motorcycles		
United Kingdom	$136,406	$40,166
Belgium	.....	523
Germany	.....	152
U. S. A.	157,078	269,387
	$293,484	$310,228
Rubber Manufactures		
United Kingdom	$524,690	$240,050
Canada	118,314	47,139
Commonwealth	1,895	1,159
Belgium	380	.....
France	59,822	16,692
Germany	399	86
Italy	77,363	26,985
Japan	21,335	20,810
Russia	114	100
Sweden	28	53
Switzerland	9	.....
U. S. A.	1,964,382	1,083,050
	$2,768,731	$1,436,124

Overland Profits $3.16 a Share

Net Profits Less Than in 1916 —Assets of Company Now $113,292,701

TOLEDO, April 2—The report of the Willys-Overland Co. and its subsidiaries for 1917 shows a net income, after all deductions, including reserve for taxes, of $6,121,544, equivalent to $3.16 a share on the common stock. This is figured after payment of regular preferred stock dividends. In 1916 the company earned $9,565,718, equivalent to $5.71 a share on the common stock then outstanding. The decrease in actual earnings amounted to $3,444,174.

The net earnings of the company and its subsidiaries, after ordinary deductions and reserve for taxes, increased slightly in 1917, being $10,193,490 as compared with $10,016,420 in 1916. The decrease in net income was due to the writing off of $1,330,798 for depreciation and an increase in interest charges. As the dividends paid on the common stock exceeded the actual earnings after all deductions were made, the company drew on its surplus to the extent of $2,318,026. This, with other expenses charged against the surplus, decreased it from $27,596,593 to $24,301,384.

Orders for airplane motors and parts to the present time amount to more than $12,000,000, and further orders are assured, according to the report of John N. Willys, president. In addition, the company has received an ordnance contract amounting to $15,000,000, and the company has completed negotiations for a munitions contract. Plans have been made for filling truck contracts as another means of counteracting the passenger car curtailment.

The net income account of the company and its subsidiaries for 1917 compares as shown in the table below.

In relation to the purchase of an interest in the Curtiss Aeroplane & Motor Corp., Mr. Willys said that this had proved to be of great strategic value in that the manufacturing ability of the latter company had been greatly increased, and was of distinct value to the Government, due to the facilities added by the use of Willys-Overland factories.

	1917	1916
Net earnings	**$10,193,490	$10,016,420
Depreciation	1,330,798	.....
Tool replacements	1,030,000	.....
Written off*	559,940	.....
Contingency reserve	.....	.....
Interest	1,151,208	450,702
Balance	$6,121,543	$9,565,718
Pfd dividends	1,138,341	994,705
Pfd stk redempt res.	450,000	.....
Com dividends	4,885,237	2,503,249
Com stk div	1,965,991	1,155,690
Deficit	$2,318,026	$4,912,074
Premiums	.....	7,963,970
Prev surplus	27,596,594	14,720,549
Total surplus	$25,278,568	$27,596,593
Written off†	74,243	.....
Develop expense‡	902,941	.....
P & L surplus	§$24,301,384	$27,596,593

*Parts of discontinued models written off.
†Good will of subsidiary company purchased and written off.
**Net earnings and income of all companies for the year after deducting repairs and maintenance of the properties, bad and doubtful accounts receivable and provision for Federal taxes.
‡Development expense attributable to new work for 1918 delivery written off, per resolution of directors.
§Surplus.

The consolidated balance sheet, as of Dec. 31, 1917, compares as follows:

ASSETS

	1917	1916
Real est., mach., etc.	$31,290,156	$28,779,013
Good will, patents, etc.	14,059,932	14,050,932
In in & ad to affil cos.	8,021,326	2,291,642
Inventories	40,589,808	38,589,539
Due from agents	112,756	624,489
Accounts rec.	3,642,568	4,435,081
Notes rec.	2,863,201	2,158,438
Cash	9,593,870	11,404,950
Lib bds for emp acct.	515,165	.....
Misc. investments	2,094,714	385,639
Def. charges	509,201	381,279
Total	$113,292,701	$103,110,006

LIABILITIES

Preferred stock	$18,006,100	$15,000,000
Common stock	39,385,462	37,273,844
Real est mtge assu	225,000	165,000
Notes and bills pay	17,937,860	11,849,067
U S Gov adv on cont.	2,500,000	.....
Accounts pay.	6,926,635	7,538,411
Payrolls & sal acc'd.	353,744	531,256
Dealers' depos.	628,065	808,324
Taxes & int acc, etc.	1,245,841	1,085,008
Pfd. dividend pay.	315,106	262,500
Res. for contingen.	1,000,000	1,000,000
Res. for red pfd stk.	467,500	.....
Surplus	24,301,384	27,596,594
Total	$113,292,701	$103,110,006

Overland Prices Increased

TOLEDO, April 1—The Willys-Overland Co. has added from $35 to $100 to the prices of both passenger cars and trucks. The new prices, which are effective to-day, follow:

MODEL 90	New Price	Old Price
Touring	$850	$795
Roadster	835	780
Country Club	875	840
Sedan	1,340	1,240
Chassis	800	710

MODEL 85 B—4	New Price	Old Price
Touring	$965	$930
Roadster	965	915
Sedan	1,485	1,485
Coupe	1,285	1,285
Chassis	880	845

MODEL 85 B—6	New Price	Old Price
Touring	$1,195	$1,130
Roadster	1,195	1,115
Sedan	1,620	1,620
Coupe	1,420	1,420
Chassis	1,110	1,045

MODEL 88—4 (KNIGHT)	New Price	Old Price
Touring	$1,625	$1,525
Sedan	2,325	2,225
Coupe	2,275	2,175
Limousine	2,425	2,325
Chassis	1,475	1,375

MODEL 88 (KNIGHT)	New Price	Old Price
Touring	$2,100	$2,000
Varsity	2,550	2,550
Sedan	2,800	2,700
Coupe	2,675	2,675
Limousine	2,900	2,800
Town Car	2,900	2,800
Chassis	1,950	1,850

MODEL 89—WILLYS SIX	New Price	Old Price
Touring	$1,450	$1,365
Club Roadster	1,450	1,365
Sedan	2,045	2,045
Chassis	1,330	1,245

COMMERCIAL CARS	New Price	Old Price
Model 90 Express	$840	$785
Model 90 Panel	865	810
1200 lb. Express	975	930
1200 lb. Chassis	915	880

Pierce-Arrow Earns $11 a Share

Profits Slightly Less Than in 1916—Gross Business Increases 75 Per Cent

BUFFALO, April 2—The Pierce-Arrow Motor Car Co. has issued its report for 1917, which shows net earnings of $3,629,472 after deduction of Federal taxes. After payment of preferred dividends, the balance of net profit is equal to $11.19 a share on the outstanding common stock, as compared with $13.08 in 1916.

The surplus increased from $242,215 in 1916 to $2,415,963 last year. Gross sales amounted to $32,565,908 as against $18,687,287 in 1916, an increase of 75 per cent. Much of this was due to war orders received from the United States and allied governments, according to the report of the president, Charles Clifton.

The increase in gross business was accompanied by an increase of inventory of 53 per cent. Unfilled orders for trucks and passenger cars aggregated 5098 on

	1917	1916
Net earnings	*$4,791,274	$4,076,167
Federal taxes	1,161,802	.....
Balance	$3,629,472	$4,076,167
Other income	11,858	63,842
Total	$3,641,330	$4,140,009
Interest	42,582	69,750
Net profit	‡$3,598,748	$4,070,259
Preferred dividends	800,000	.....
Common dividends	625,000	.....
Surplus	$2,173,748	†$4,070,259

*Net manufacturing profit, after providing $487,559 for depreciation of properties in 1917.
‡After preferred dividends, the balance of net profit was equal to $11.19 a share on 250,000 shares of common stock of no par value, as compared with $13.08 a share earned in 1916.
†Of this amount, $3,770,266 was the proportion applicable to the operations of the predecessor company; and the balance, $299,993, was profit of the new company from December 6, 1916, to December 31, 1916.
Preferred dividends paid in 1916 amounted to $57,778 for period December 6 to 31, 1916, at the rate of 8% per annum.

The consolidated balance sheet, as of Dec. 31, compares as follows:

ASSETS

	1917	1915
Property account	$5,431,438	$4,443,406
Affiliated company investment	40,000	40,000
Bond redemption fund.	.....	1,287,500
Inventories	14,837,786	9,680,057
Notes and accounts receivable	3,665,633	1,450,928
Miscella. investments & deposits	86,463	43,322
Cash	1,192,697	1,463,676
Liberty bonds	634,991	.....
Deferred charges	195,905	.....
Total	$26,084,913	$18,408,889

LIABILITIES

Preferred stock	$10,000,000	$10,000,000
Com. stock — 250,000 shares (no par value)	1,250,000	1,250,000
Capital surplus	4,081,412	4,081,596
Bonds	.....	1,250,000
Bank loans	5,141,533	.....
Accounts payable	1,914,402	1,422,584
Customers' deposits	119,800	124,994
Accrued interest	.....	37,500
Accrued war taxes	1,161,802	.....
Bond redemption fund.	.....	1,287,500
Surplus	2,415,963	242,215
Total	$26,084,913	$18,408,889

Jan. 1, 1918, as against 1343 on Jan. 1, 1917.

The net income account of the company for 1917 is given on the opposite page.

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Signal Corps Uses 7 Types of Trucks

WASHINGTON, March 30 — Seven types of trucks are used in the Signal Corps. Before June, 1917, two other makes of trucks were purchased and put into service, thus making nine types of trucks now in the service, although only seven are being ordered at this time. The various types of trucks used include the following:

1—The light standardized Signal Corps truck.
2—The heavy standardized type.
3—The Nash four-wheel-drive truck.
4—The F. W. D. four-wheel-drive truck.
5—The Ford 1-ton truck.
6—The Dodge Bros. 1500-pound light delivery vehicle.
7—Pierce-Arrow 5-ton truck.

In addition, three different types of passenger cars are used for the officers, including Ford, Dodge Brothers and Cadillac cars. It is expected that the Fords and Dodges will be used for officers having the rank of captain and under, and Cadillacs for officers having the rank of captain and above except for the higher commands, members of staffs and the chief generals. It is said that General Pershing is using a rebuilt Rolls-Royce.

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Chicago-St. Louis Airplane Mail Service

CHICAGO, April 2—Airplane mail service between this city and St. Louis was arranged for yesterday at a conference of the postmasters of the two cities. The plan has been under consideration for some time, and is certain of fulfillment, although no details as to time schedules, the number of planes to be used, etc., have been decided on yet.

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Liberty Loan Payments Announced

PHILADELPHIA, April 3—Subscriptions for the Third Liberty Loan will open April 6 and close May 4. Installments are payable as follows:

5 per cent on application.
20 per cent May 28.
35 per cent July 18.
40 per cent August 15.

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Armored Biplane Driven to Capital

WASHINGTON, March 30—A new armored National biplane driven by an Hispano-Suiza engine arrived here today from Dayton, Ohio. It was manufactured by the Standard Aircraft Corp., Dayton, and driven here by R. Bounds, of that company. Bounds established a new time record for a continuous nonstop flight over mountainous countries, making the 700 miles in a little more than 8 hours. The biplane has developed a maximum speed of 100 m.p.h. A series of tests will be made here by Government officials.

White Earnings Are $3,800,308

Approximately the Same as 1916 After Deduction of Taxes —24 Per Cent of Stock

CLEVELAND, April 1—The White Motor Co. earned net profits of $3,800,308 in 1917, after the deduction of income and excess profits taxes. This is equal to 24 per cent of the $16,000,000 outstanding capital stock, approximately the same as in 1916, when there were no taxes to deduct.

Assets amount to $25,573,537, an increase of $4,366,757 over 1916, most of which has been added to the surplus. Current liabilities of 1917 are only $4,057,236, leaving a net working capital of $20,244,301.

The net income account of the company for 1917 compares as follows with that of 1916:

	1917	1916
Operating profit	*$4,494,749	$4,087,027
Other income	335,559	354,014
Total	$4,830,308	$4,441,041
Federal taxes	1,030,000	.....
Reserve	.....	740,000
Balance	†3,800,308	3,701,041
Dividends	1,280,000	1,160,000
Surplus	$2,520,308	$2,541,041
Previous surplus	2,541,041	.....
Adjustment	154,951	.....
P. & L. surplus	$5,216,300	$2,541,041

*Operating profit after deducting manufacturing, selling, and other expenses.
†Equal to $11.87 a share on 320,000 shares of capital stock ($50 par), as compared with $11.56 a share earned in 1916.

The consolidated balance sheet, as of Dec. 31, 1917, compares as follows:

Assets:	1917.	1916.
Property account	$4,235,380	$4,016,491
Good will, patents, patterns, etc.	5,388,910	5,388,910
Inventories	9,638,129	6,835,176
Accounts receivable	3,629,589	1,809,621
Notes receivable	1,499,185	1,041,696
Cash	698,600	1,988,379
Liberty bonds	125,448	.....
Investments	240,000	.....
Deferred assets	118,296	126,507
Total	$25,573,537	$21,206,780
Liabilities:		
Capital stock	$16,000,000	$16,000,000
Purchase money obligations	.....	175,000
Notes payable	300,000	.....
Accts. pay. & payrolls.	2,118,212	952,750
Deposits on cars	104,589	147,047
Accrued liabilities	64,435	479,469
Depreciation reserve	.....	171,472
Inventory reserve	740,000	740,000
Tax reserve	1,030,000	.....
Surplus	5,216,301	2,541,042
Total	$25,573,537	$21,206,780

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May Have Independent Accessory Show

CHICAGO, April 2—The possibility of an independent accessory show separate from that in connection with the national shows and not in any way connected with the September accessory show scheduled for Chicago is suggested in a bulletin which is being sent out this week by Commissioner William M. Webster of the National Association of Automobile Accessory Jobbers. The bulletin states that the board of directors of the association by practically unanimous vote will recommend at the Virginia Hot Springs convention that the date of the annual meeting be changed from January to the last week in October.

The change is made because a January meeting brings the following meeting into May, which is a bad time for jobbers to leave their businesses. It is suggested that an accessory show be held in conjunction with the October meeting and, if possible, under the same roof. Commissioner Webster has not applied for sanction from the Motor and Accessory Manufacturers' Assn. He states that he has obtained options on several places for the proposed combined convention and accessory show. The matter will be brought up for ratification at the Hot Springs convention.

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Many Liberty Engines Shipped

WASHINGTON, March 29—Announcement was made here yesterday that the Navy Department now has more than 80 airplanes equipped with Liberty engines, and that a large number of the Liberty engines have already been shipped to Great Britain and France. An airplane equipped with a Liberty engine yesterday attained a height of 21,500 ft., thereby breaking previous records.

The criticism that there are not enough planes being turned out is viewed with astonishment by army officials, who state that the greatest plane difficulty is finding storage space to store those made and awaiting engines. Announcement was also made that General Pershing now has well over 100 combat airplanes in his organization.

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Liberty Engine on Long Trip

HAMPTON, VA., April 1—A Liberty engine installed in a Curtiss biplane was used to-day in a flight from this city to Annapolis, Md., and back. There were three passengers and a pilot aboard. The motor acted perfectly throughout the trip and splendid time was made, according to reports of army officers.

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Asks Time for Profits Tax Payments

WASHINGTON, March 30—Fearing that full payment of excess profits taxes on June 15 will seriously injure the financial system of the country, Representative L. T. McFadden urged Secretary McAdoo in a speech in the House yesterday to authorize a plan whereby the tax will be paid in instalments ranging over a 4 months' period. Congressman McFadden pointed out that payments on both Liberty loans and the profits tax fall together, with the result that billions of dollars will be called for in a lump sum. It is now estimated that the excess profits tax will produce $3,400,000,000.

—

Rainier Price Increase

NEW YORK, March 30—The Rainier Motor Corp. has advanced the prices of its truck models as follows:

Chassis Model	Old Price	New Price	Increase
½-ton	$995	$1,150	$155
¾-ton	1,150	1,250	100

The price of the 1¾-ton chassis remains $1,350.

Plenty of Chrome Ore in Sight

Sufficient Discovered in United States to Warrant Releasing Caledonia Ships

WASHINGTON, April 3—There will be sufficient chrome steel for 1918 to meet all requirements both for war and industrial purposes. Chrome ore has been found in sufficient quantities in this country to warrant an order taking from their usual channels of work the many boats hauling chrome ore from New Caledonia to the United States.

Estimated liberally, officials state that 151,000 tons of all grades of chrome ore will be required in 1918 to fill the demand. Reduced to the 50 per cent chrome grade average, this means 146,000 tons are needed. As Automotive Industries stated last week, 80,000 tons of 50 per cent chrome has been located in storehouses throughout the country. Last year's total production was 70,000 tons, including 25,000 tons of 45 per cent grade from Brazil and 14,000 tons of 50 per cent grade from Cuba with the balance from New Caledonia.

This means that if this supply with the new supply of chrome ore found in California, Delaware, Oregon and other states only equals the last year's Caledonian shipment, there will be 150,000 tons, which makes the required amount.

Officials are sanguine, however, of securing far more chrome ore in this country than has ever been brought from New Caledonia.

One remaining problem is that of sufficient electrodes for smelting the ore, and this, too, seems in the way of solution. One Californian company claims to have discovered a satisfactory method for making electrodes, and has already a number of smelting furnaces with others en route. In addition, there are the big furnaces of the carbon combine and the electrode producing facilities of the electro-metallurgical companies at Niagara Falls, which can be used to augment production.

The uncovering of the present chrome ore in quantities came about through two separate investigations, coming at the same time. The shipping board, anxious to use the Caledonia ships for other purposes, commenced an investigation, and California, interesting in exploiting its chrome ore mines, started a similar investigation.

The California investigation was due primarily to inability to secure priority for electrodes from Niagara Falls. W. T. Moreland, of the Moreland Motor Truck Co., Los Angeles, and F. S. Blackall, of the Taft-Pierce Co., Woonsocket, R. I., were called to Washington by the War Industries Board and conferred with shipping officials and the War Board. Mr. Blackall entered into the conference because he made an investigation of the chrome ore situation for the Motor and Accessory Manufacturers' Assn. Mr. Moreland was in the conference because of his interest in the chrome ore mines.

The result of the conference was satisfaction on the part of all that the chrome ore in this country is ample for all needs, and as a result the Caledonia ships were released.

California chrome, it is said, is of lower quality than Caledonia ore, having more impurities, but it can be used to produce the same result as Caledonian chrome by calculations on the part of the steel industry of the foreign substances which are the same and are found in Caledonia steel but are in greater quantities.

There is also an investigation at this time because of the difference in price between ferro-manganese and ferro-chrome. The manganese is selling at $250 per ton while chrome is $427, and there is no apparent cause for this difference. There are rumors of monopoly behind the electrode supply, of which it is said that 96 per cent is made by one concern.

—

Ordnance Contracts Awarded

WASHINGTON, April 3—Ordnance contracts were awarded March 22, as follows, according to information released to-day:

G. Edward Budd: Body mounting sills and hardware for mounting.
Continental Power of America: Body mounting sills.
Stewart Iron Works: Body mounting angles.
Salisbury Wheel & Axle Co., Jamestown, N. Y.: Sprag release assemblies.
Thomas Hinds Co., Malone, N. Y.: Sprag release assemblies.
E. A. Laboratories, Brooklyn, N. Y.: Horn brackets.
Columbus McKinnon Chain Co., Columbus, Ohio: Towing chains.

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McFarlan Motors to Make Trucks

CONNERSVILLE, IND., April 1—The McFarlan Motors Co. will engage in the manufacture of trucks in addition to cars. The first model to the produced will be a 3½-ton truck, with worm drive and equipped with a special 6-cylinder motor to be manufactured by the Teeter-Hartly Motor Co., Hagerstown, Ind. The estimated selling price of the new truck will be about $4,000.

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Studebaker Ends Test Drive

CHICAGO, March 29—Thirty thousand miles at 45 m.p.h. is the way in which Studebaker's new models were tested out to determine their ability to stand up under long use. This unusual baptism of speed was given the new cars on the Chicago speedway this winter. After their grind the three cars which underwent the test were taken to the Studebaker factory of Detroit and torn down to see what this mileage had shown up in the way of wear.

The cars were started on the track December 14. The Big Six finished March 3, the Light Six March 7, and the Four March 12, each completing 30,000 miles. The longest day's run was 731 miles made by the Big Six with the thermometer ranging about 10 degrees below zero.

Thefts of Parts Under Federal Law

Branch Houses Must Pay 3 Per Cent Tax on Retail Sales Price

NEW YORK, April 3—Some automobile makers have driven away through their dealers 25 per cent of the cars manufactured during the past quarter and there are a few concerns in which 25 to 30 per cent of their product is being driven overland. As a result of this the automobile industry has been doing its share of relieving the railroads of as much freight as possible. These facts brought out in the report of the Traffic Committee of the N. A. C. C. at the regular monthly meeting of the chamber held to-day indicate that railroad carload shipments during the last quarter have dropped off as compared with the corresponding quarter a year ago.

The crating of engines shipped by railroad came up for consideration in that the Classification Committee of the Railroad War Board has been planning to require the boxing of engines for shipment instead of handling them in open crates. J. B. Marvin of the Traffic Committee submitted arguments opposing such a regulation.

The N. A. C. C. has been notified by W. G. McAdoo, director of the railroads, that thefts of lamps or other parts of automobiles while on railroad cars in transit will in future come under the federal law instead of under state laws as heretofore. This means that these thefts instead of being treated as petty larceny acts will under the federal law be liable to a maximum penalty of ten years imprisonment.

The N. A. C. C. will be represented at the National Foreign Trade Council in Cincinnati on April 18, 19 and 20, by J. Walter Drake, chairman of the export committee, and by John N. Willys. Mr. Willys will represent the chamber in the reading of a paper showing the importance of automobile exports to the country at large during the war as well as after it.

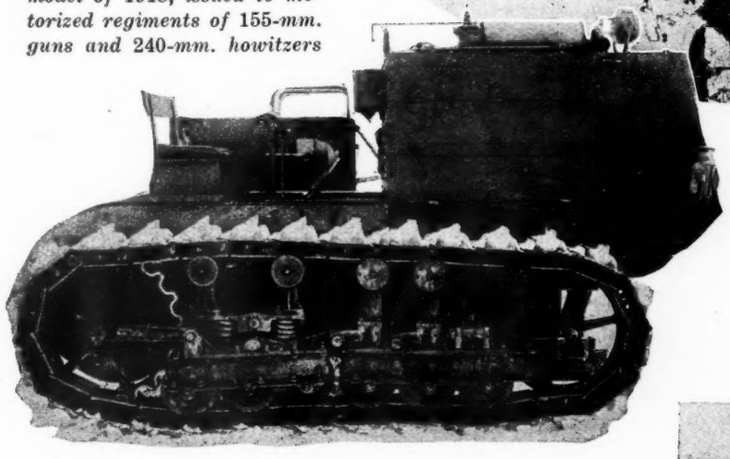
A new ruling has been handed down by the treasury department at Washington with regard to the 3 per cent tax on automobiles. The ruling is that branch houses shall be treated as factories so that when a branch house sells an automobile it will have to pay the 3 per cent tax on the retail price the car is sold at. This new ruling is directly opposed to the earlier understanding of the law and is considered very unjust by the N. A. C. C. The ruling has come from the deputy commissioner at the Treasury Department in Washington, and is being protected by the N. A. C. C.

The chamber appointed two delegates to the meeting of the U. S. Chamber of Commerce to be held in Chicago, April 10, 11 and 12. They are Herbert H. Rice of the General Motors and Col. Charles Clifton.

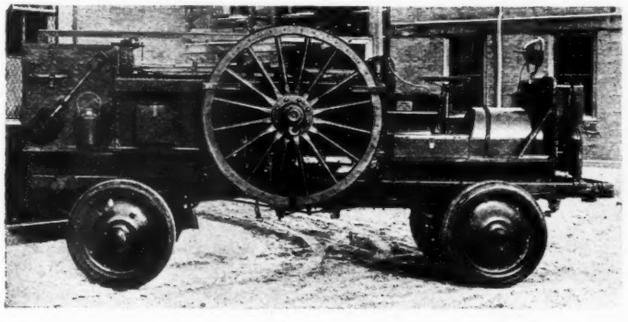
Types of Motor Vehicles Used by the U. S. Army

Trucks and Tractors Have Been Devised for Every Military Need

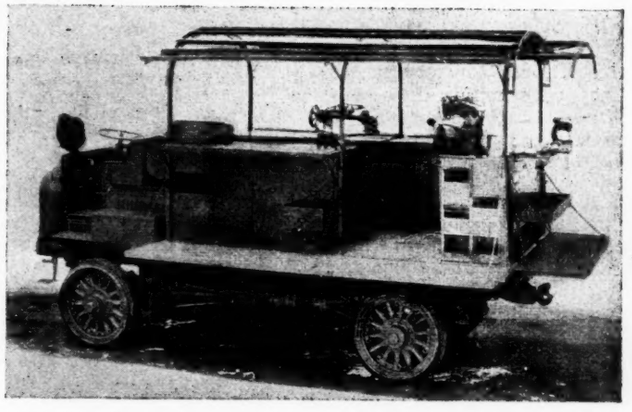
Ten-ton artillery tractor, model of 1918, issued to motorized regiments of 155-mm. guns and 240-mm. howitzers



Five-ton artillery tractor, in a test, hauling a 6-in. howitzer through a muddy creek



Artillery supply truck used in motorized batteries, supplying companies of motorized artillery regiments, and in accompanying repair trucks



Equipment repair truck used in mobile ordnance repair shops. Complete small shop with two power sewing machines mounted

Packard Tests for Road Values

DETROIT, April 1—The Packard Motor Car Co. has made tests to determine the relative values of different roads as regards resistance to tractive efforts. It has been found that unsurfaced concrete offers a resistance of 30 lbs. to the ton, surfaced concrete 50 lbs., gravel 82 lbs. and dirt roads 99 lbs.

The experiment was made with a Packard 3-ton truck carrying a capacity load and operating at a speed of 12 miles an hour. Taking the unsurfaced concrete as standard, the truck will make 7.2 m.p.h. over surfaced concrete, 4.8 m.p.h. over gravel and 3.6 m.p.h. over dirt roads. This makes a relative cost of 16.7, 19.4 and 20.7 cents per ton-mile.

A computation has been made showing that if used roads were gravel instead of dirt, the annual saving in operating America's 400,000 motor trucks would amount to $70,200,000; if concrete instead of gravel, $167,400,000, and if concrete instead of dirt, $237,600,000.

Landover Truck in Government Tests

MARINETTE, WIS., March 30—The Landover Truck Co. has sent one of its 3-ton trucks on a long-distance trip to Houston, Tex., where it will be received by Government experts and put through army tests.

The truck, which was sent overland in order to conserve time, is a stock model, fully equipped, and is in charge of H. S. Lawrence, a member of the Landover company.

International Earns $1,127,093

Assets Are Now $12,704,372—Increase of 50 Per Cent Over 1916

NEW YORK, April 1—The International Motor Truck Corp., in its report for the year ended Dec. 31, 1917, shows net profits of $1,127,093. The balance sheet as of Dec. 31 shows current assets of $8,684,043 and current liabilities of $1,938,771, leaving a net working capital of $6,745,272. Cash on hand amounted to $2,227,853 and the profit and loss surplus was $1,192,574.

During the year the property account was increased $99,404, and many additions are under way, which will increase production greatly.

The consolidated balance sheet, as of Dec. 31, 1917, compares as follows:

ASSETS

	1917	1916
Property account	$1,731,476	$1,010,718
Patent rights, good will, etc.	2,164,436	2,157,920
Investments	12,188	12,187
Cash	2,227,853	714,067
Accounts and notes receivab'e	1,664,195	973,136
Inventories	4,791,995	3,222,704
Deferred charges	112,229	185,289
Total	$12,704,372	$8,276,021

LIABILITIES

First preferred stock	$4,243,117	$4,243,771
Second preferred stock	2,656,450	2,656,450
Common stock	268,190	268,190
Funded debt	34,500	33,000
Two-year notes	1,500,000	.....
Mortgage	.....	6,500
Unacquired securities of I. M. C.	66,550	66,550
Accounts payable	926,609	799,267
Accrued accounts	589,156	.....
Customers' deposits	423,006	.....
Reserves	803,565	136,812
Surplus	1,192,575	65,481
Total	$12,704,372	$8,276,021

—

Collier Company Has Annual Meeting

BELLEVUE, OHIO, March 30—At a stockholders' meeting of the Collier Motor Truck Co. F. W. Steinen and Charles Matz were elected to the board of directors. The retiring officers were re-elected.

The company is making preliminary plans for a factory building to be built on the land owned by the company here. New agencies have been established in New York, Pennsylvania, Massachusetts, Rhode Island, Connecticut, Delaware, Ohio, Michigan and Louisiana, and the company will soon announce additions to the line of Collier trucks.

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Changes in Selden Organization

ROCHESTER, N. Y., March 30—At a meeting of the directors of the Selden Truck Sales Co. yesterday George C. Gordon was re-elected president. The following were also elected: William C. Barry, first vice-president; Robert H. Salmons, formerly secretary, second vice-president; Hal T. Boulden, formerly sales director, vice-president in charge of sales and advertising; Wilbur F. Reynolds, formerly export manager, third vice-president in charge of foreign sales, and Edwin B. Osborn, formerly assistant treasurer, secretary and treasurer. Charles E. Williams was appointed assistant sales manager. C. Henry Mason will handle advertising under Mr. Boulden.

At the meeting the capital stock of the company was increased to $750,000.

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Ship Repair Parts by Mail

WASHINGTON, April 1—The War Trade Board has arranged through the postal service a special export license No. R.A.C.-50, authorizing until April 15, 1918, exportation through the mails of repair parts for agricultural implements to England, France, Italy or Japan or their colonies, possessions or protectorates. This will permit manufacturers of farm tractors to ship to the countries indicated such repair parts without securing the individual licenses for them which have been necessary heretofore.

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Many to Attend Salesmanship Congress

DETROIT, April 1—Plans for the third annual World's Salesmanship Congress to be held here April 24-27 are maturing rapidly. Reservations are coming in in great numbers and, according to present indications, it will be attended as well as, if not better than, last year's session. Four well-known business men are coming from Japan. They are: T. Alasaka and Uhei Satou of Tokio, Saijiro Ishizaki of Osaka, and Shinjiro Nomi of Bendai, Japan.

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Youngsville Radiator Reorganized

SPRINGFIELD, N. Y., March 30—The Youngsville Radiator Co. has been reorganized and is now styled The Standard Radiator Co., Inc. Capital has been added and the following directors have been elected: Park Taylor, S. E. Walker, T. B. Cawson, Fred Hemoyer and Willson Bement. C. A. Erickson, formerly sales engineer for the company, has been appointed general manager.

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Lee Tire Re-elects Officers

CONSHOHOCKEN, PA., March 30—James A. Fayne and Walter R. Herrick have been elected directors of the Lee Tire & Rubber Co. to fill the vacancies caused by the resignations of John W. Prentiss and Grayson Murphy, who are in government service. The retiring officers were re-elected.

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Guaranty Securities Now Continental Guaranty

NEW YORK, March 30—On and after April 15 the Guaranty Securities Corp. will be styled Continental Guaranty Corp. to give a more definite idea of the functions of the company. The change of style involves no change of ownership or management.

Plenty of Gasoline, Says Requa

In Talk to Oil Jobbers' Assn. He Repeats That Transportation Is Only Difficulty

CHICAGO, March 30—That there is plenty of gasoline and oil was reaffirmed to-day by Mark L. Requa, director of the oil division of the National Fuel Administration. Director Requa said: "As conditions stand to-day, there is no immediate necessity for curtailment in the proper uses of gasoline and oil, but oil and gasoline should be used carefully and economically. There is none to waste. Oil and gasoline are," he said, "like the whole war, purely a question of transportation."

This was a part of the fuel director's talk to the Western Oil Jobbers' Assn., which has been in convention here and ended with a dinner last night. The name of the association was changed to the American Petroleum League.

Director Requa laid stress upon the error of placing reliance on "doing business as usual," in his talk on "War Service in the Petroleum Industry." He said that business was not "as usual," and will not be as long as the war lasts.

"Transportation—railroad cars, engines, ships—these are the crux of the situation. We have the facilities for the production of oil in any quantities the Government and public need, but we cannot always get it where it is needed."

In discussing the plan of regional distribution of petroleum and its products, which is being worked out, he expressed confidence that whatever the national needs may be, everything that is necessary will be done to meet those requirements.

"If zonal distribution of petroleum products is necessary to supply what the nation needs, zonal distribution will be accomplished. If pooling of tank cars and ships will meet national demand more efficiently, these facilities will be pooled. If well-drilling supplies must be allocated to produce the greatest quantity of oil to meet increasing demands, the well-drilling machinery will be allocated. If the petroleum industry or any part of it is so unwise as to engage in profiteering, ways and means will be found to correct that condition."

Effect of gasoline and oil-operated engines in the improvement of city transportation was illustrated by Sheldon Clark, chairman of the Legislative Committee of the National Petroleum Assn., when he predicted that Chicago would have a population of 10,000,000 by 1950. This growth, he said, would come through better transportation facilities, developed through the use of petroleum.

Petroleum products' effects on the war were brought out in Mr. Clark's statement that with the expansion of the oil industry we are becoming the king breakers, for without oil the war against autocracy could not be carried to a suc-

cessful conclusion. The Kaiser would be so safely ensconced on his throne of privilege there would be little chance of dragging him down if it were not for the oil supplies.

—

Army Industrial Service Organization Completed

WASHINGTON, April 2—Charles P. Neill, manager of the bureau of information of the southeastern railways and former commissioner of labor, has been appointed Chief of Industrial Service for the Signal Corps, and W. Jett Lauck, editor of the *Labor Gazette*, has been named as his assistant. This marks the completion of industrial service organizations for the various army divisions which are now organized as follows:

Industrial service section, Ordnance Bureau: Herman Schneider, chief.
Industrial service section, Quartermaster Corps: E. M. Hopkins, chief.
Industrial service section, Signal Corps: Charles P. Neill, chief.
Industrial service section, Construction Corps: Col. J. H. Alexander, chief.

The chief duty of each of these sections is to promote the most efficient relations between employers engaged in war work and their employees and to formulate the working standards, including hours, wages, etc., best calculated to improve production.

—

Studebaker 1918 Profits to Be $6,000,000

DETROIT, April 3—A. R. Erskine, president of the Studebaker Corp., told the stockholders at their annual meeting yesterday that the company's net profits for 1918 would total $6,000,000 as against $3,500,000 last year.

He said that 30,000 cars would be produced this year, despite the fact that 50 per cent of the plant has been turned over to government work. The plants are ready to produce 125,000 cars a year after the war.

Arthur Lehman was elected a member of the board of directors to succeed Major Herbert Lehman, who has entered government service. The remaining directors were re-elected.

—

Spies Active in Airplane Factories

WASHINGTON, April 3—Additional disclosures of activity of German spies in airplane factories were made Saturday in the Senate by Senator Overman. The Senator read letters he had received from employees of the Curtiss and the Wright factories at Buffalo, N. Y., and Dayton, Ohio, respectively. Acid and other substances have been mixed with glue, wires have been filed and other parts have been tampered with according to the information he has received.

The letter received from Buffalo said that there were many employees of pro-German tendencies in that plant.

When the Senator made his charges in the Senate, he displayed a part of an airplane framework. Holes had been drilled in the steel and filled with lead.

Steel Air Propeller Wanted

Committee on Aeronautics Asks Engineers to Design This Type Combined with a Variable Pitch

WASHINGTON, April 2—A steel air propeller combining a variable pitch is sought by the National Advisory Committee on Aeronautics and the committee invites the attention of designing engineers to the problem.

The first requisite is a propeller that will fill the need for a super-charging engine, one which will enable an engine to maintain constant power at all altitudes. All airplane engines now in use lose power as they attain higher altitudes. When the air density is, for example, 50 per cent of the density at the ground, the engine loses 50 per cent of its power and is forced to double speed to attain the normal horsepower achieved at ground density.

The second requisite is that the propeller be steel, because it is believed that this will be the ultimate material for propellers. The committee advocates that designing engineers try to find the solution to both problems at one time.

Engineers of the committee offer the suggestion that the variable pitch can be controlled either by a governor, if one can be developed to alter the pitch without changing the engine's speed, or by a device at the driver's seat. They advise engineers in designing this steel propeller not to pay any attention to the wooden ones now used. They point out that when steel bridges were first made the engineers attempted to follow the design of wooden bridges and failed until they evolved new designs based upon steel strength and structure. An ideal variable pitch propeller would be one that embodies the means for changing simultaneously the diameter, area and pitch for changes in air density.

All designs will be given careful attention, and drawings should be submitted together with brief description and necessary photographs to the National Advisory Committee for Aeronautics, Munsey Building, Washington, D. C.

—

300 "B" Trucks in March

WASHINGTON, April 2—More than 300 Class B standardized war trucks were completed in March and it is expected that 1200 will be made this month. There are 3000 complete sets of parts now on hand in various assembly factories, and the prospects are excellent for a production of 3500 in May.

—

Private Shipbuilding Approved

WASHINGTON, April 2—A new shipbuilding program for private interests was approved yesterday by the Shipping Board, and Chairman Hurley announced that the request of the Atlantic & Pacific Steamship Co. for permission to place contracts with Oregon shipyards for 150 motor-driven wooden ships of 3000 tons each had been granted. The new contracts will not interfere with the government program. Eastern capitalists, including the Du Ponts, are said to be financing the plan.

—

Wright Roller Bearing Moves

SPRING CITY, PA., April 3—The Wright Roller Bearing Co. has moved its factory from this city to Philadelphia.

—

Overland Trucking Booming in Ohio

CLEVELAND, OHIO, April 1—Notwithstanding poor road conditions in various parts of the state, Ohio is booming in the use of motor trucks for the overland haulage of goods of almost every character. The largest overland haulage company in the state, if not in the entire United States, is The Highway Motor Transport Co. of Cleveland, which is at the present time operating more than eighteen large motor trucks in intercity work. These trucks cover almost the entire state with a network of routes which feature practically every one of the large or medium size industrial centers. Some of the cities served include the following: Ashtabula, Bogart, Cleveland, Conneaut, Dover, East Townsend, Elyria, Geneva, Huron, Lorain, Madison, Mentor, Milan, Norwalk, Oberlin, Painesville, Ridgeville, Rocky River, Sandusky, Unionville, Vermilion, Wakeman and Willoughby.

—

Suggest New Road for Driveaways

DETROIT, April 3—Because of the impassable conditions of the road south of Detroit on the 25-mile stretch between Rockwood and Monroe, it has been suggested that the Telegraph Road, running from Flat Rock to Monroe, be improved. This will serve as an alternate of the concrete highway to be constructed later, and can be improved easily and quickly.

—

Dodge Brothers vs. Ford Case Near End

LANSING, April 3—The Supreme Court has extended the time for oral argument to two hours each in the case of Dodge Brothers vs. Ford, the decision of which will be reached this week. The time for argument is usually one hour.

—

Change Plugs in Mid-Air

MIAMI, FLA., April 1—Joseph Bennett and Paul Bickey, pilots at the Curtiss Air School here, stalled the engine of their airplane at 8000 ft. They changed a spark plug in mid-air and resumed flight in less than 4 minutes.

—

Toronto Dealers Organize

TORONTO, ONT., April 1—A dealers' association will be formed here within the next few days, and it is expected that between 100 and 200 will attend the organization convention. The meeting is under the auspices of the Retail Merchants' Assn. of Canada, which has organized a dozen other trades with local and sectional units.

Determine Candlepower Needed for Illumination

NEW YORK, April 4—According to the best judgment of 49 observers, it requires a luminous power of 3200 candlepower, and a luminous intensity of 0.142 foot-candles, to render visible a man in dark clothing at a distance of 150 ft. from the observer; a luminous power of 6980 candlepower and a luminous intensity of 0.112 foot-candles to render visible a man in dark clothing at a distance of 250 ft. from the observer. It is also the consensus of opinion of these forty-nine observers that the maximum glare that can be tolerated from headlamps 100 ft. away from their own lamps and to one side of them, with their own lamps adjusted at the intensity which they require for observing the man on the road at a distance of 250 ft., corresponds to a luminous power of 239 candlepower and a luminous intensity of 0.024 foot-candles.

There was a wide variance between the results arrived at by different observers. Thus the candlepower necessary for observing a man in dark clothing at 150 ft. distance varied from 1,000 to 10,000, that necessary for observing the man at 250 ft. distance, from 1,300 to 18,300 and the maximum tolerable glare from 80 to 850 candlepower.

The tests were made on a piece of road between Pelham Parkway and the Morris Park station of the New York, Westchester & Boston Railroad on the night of March 5. Two pairs of parabolic headlamps were used, mounted on stands, and furnished with current from storage batteries. Before the tests were begun the field of light in which the men to be observed would move was mapped out at both 150 and 250 ft., and illumination measurements were made over the entire field while the current applied to the lamps was held at a given value. Illumination measurements were also made with other current values, so that the ratio of illumination change to current change was determined.

The tests were held under the auspices of the Committee on Automobile Headlighting Specifications of the Illuminating Engineering Society and the Lighting Division of the Standards Committee of the Society of Automotive Engineers.

—

Shontz Buys Splitdorf Battery Business

NEW YORK, April 4—The Splitdorf Electric Co., of New York, is to withdraw from the storage battery field. It has been manufacturing Apelco batteries but will discontinue this branch of its business. The H. B. Shontz Co., 157 West Fifty-fourth Street, New York, distributer and Central Service Station for U. S. L. batteries, has purchased the entire battery stock and equipment of the Splitdorf company and hereafter will distribute all parts for Apelco batteries used for ignition and lighting and starting.

Discuss Washington Rural Express Route

WASHINGTON, April 3—Plans for the establishment of a rural motor express route between Washington, Maryland and Virginia and the immediate improvement of roads leading into Washington were the chief subjects at a conference here to-day between District Food Administrator Wilson, representative business men and presidents of trade and civic bodies. It is feared that unless a motor truck line is soon established and the highways improved, Washington will run short of garden produce. The meeting to-day was held to obtain the co-operation of the various local organizations.

National Labor Board Would Eliminate Strikes

WASHINGTON, April 4—As a means to eliminate strikes and to settle disputes between labor and capital, Secretary of Labor William D. Wilson has proposed the establishment of a National War Labor Board. This board would have the power of calling together representatives of capital and labor to hear both sides of controversies and, in cases where the board itself could not effect a satisfactory settlement, to appoint an umpire. The board would hold regular meetings in Washington and in its mediating and conciliatory action would be governed by the principle that there should be no strikes or lockouts during the war. The right of workers to organize is recognized, though they are forbidden to use coercive measures; organized labor agrees to abandon any demand for the closed shop.

—

Haynes to Increase Production

KOKOMO, IND., April 1—The Haynes Automobile Co. is attempting to increase its production to fill its government contracts as soon as possible. The company has been advertising its need of 1000 workmen and intends to add this many men to its payroll as soon as possible. The company has just announced that a total of $300,000 of its preferred stock has been retired.

—

Mason to Make Solid Tires

KENT, OHIO, April 4—The Mason Tire & Rubber Co. will start the manufacture of solid tires in all sizes. In addition the company will make a new model of pneumatic tire styled "Kent-tire" exclusively for certain jobbers.

Automotive Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	52	55	+2
*J. I. Case T. M. Co. pfd.	84	86	—2
Chalmers Motor Co. com.	6	8	..
Chalmers Motor Co. pfd.	30	40	..
*Chandler Motor Co.	80	82	—2
Chevrolet Motor Co.	116	120	+4
*Fisher Body Corp. com.	26	34	—1
*Fisher Body Corp. pfd.	75	87	+7
Fisk Rubber Co. com.	50	53	..
Fisk Rubber Co. 1st pfd.	98	103	..
Fisk Rubber Co. 2nd pfd.	70	75	..
Firestone Tire & Rubber Co. com.	92	94	—2
Firestone Tire & Rubber Co. pfd.	96	98	..
*General Motors Co. com.	117½	118½	..
*General Motors Co. pfd.	81	83	+2
*B. F. Goodrich Co. com.	42	42	—2
*B. F. Goodrich Co. pfd.	93	99	..
Goodyear Tire & Rubber Co. com.	135	138	..
Goodyear Tire & Rubber Co. pfd.	96	98	..
Grant Motor Car Corp.	3	4	..
Hupp Motor Car Corp. com.	3	3½	..
Hupp Motor Car Corp. pfd.	85	90	..
International Motor Co. com.	22	26	+2
International Motor Co. 1st pfd.	52	56	..
International Motor Co. 2nd pfd.	23	27	..
*Kelly-Springfield Tire Co. com.	42	44	+1
*Kelly-Springfield Tire Co. 1st pfd.	75	85	..
*Lee Rubber & Tire Corp.	12	13	—1
*Maxwell Motor Co., Inc., com.	26½	27½	—1
*Maxwell Motor Co., Inc., 1st pfd.	53	55	+3½
*Maxwell Motor Co., Inc., 2nd pfd.	20	20½	—2
Miller Rubber Co. com.	110	115	—15
Miller Rubber Co. pfd.	95	97	—1
Packard Motor Car Co. com.	92	97	—3
Packard Motor Car Co. pfd.	89	92	..
Paige-Detroit Motor Car Co.	17	18	—2
Peerless Truck & Motor Corp.	14	16	— ½
Portage Rubber Co. com.	107	109	—1
Reo Motor Car Co.	16	17	—2
*Saxon Motor Car Corp.	7	9	..
Standard Motor Construction Co.	12½	13½	+2¼
*Stewart-Warner Speed. Corp.	54	55	—2
*Studebaker Corp. com.	38½	39½	—7
*Studebaker Corp. pfd.	89	91	—3
Swinehart Tire & Rubber Co.	25	40	+5
United Motors Corp.	26⅛	26¼	— ¼
*U. S. Rubber Co. com.	54	55	— ½
*U. S. Rubber Co. pfd.	102	104	+1
*White Motor Co.	41	42½	— ½
*Willys-Overland Co. com.	17	18	..
*Willys-Overland Co. pfd.	81	82½	+1

*At close March 30, 1918. Listed N. Y. Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS	Bid	Asked	Net Change
Auto Body Co.	..	8	..
Bower Roller Bearing Co.	17	18½	..
Chevrolet Motor Co.	114	118	—1
Commerce Motor Car Co.	..	10⅜	..
Continental Motor Co. com.	5½	5⅝	+ ⅛
Continental Motor Co. pfd.	92½	95	..
Edmunds & Jones com.	..	..	..
Edmunds & Jones pfd.	..	..	..
Ford Motor Co. of Canada	200	..	—5
Hall Lamp Co.	13½	13⅞	..
Michigan Stamping Co. com.	12¾	13⅜	— ⅛
Motor Products	..	..	..
Packard Motor Car Co. com.	90	95	..
Packard Motor Car Co. pfd.	98	91	+9
Paige-Detroit Motor Car Co.	16½	..	..
Prudden Wheel Co.	11	12¼	..
Reo Motor Car Co.	16⅛	16⅜	..
INACTIVE STOCKS			
Atlas Drop Forge	..	27¼	..
Kelsey Wheel Co.	90	92	+4
Regal Motor Car Co.	..	..	..

Industrial Review of the Week

A Summary of Major Developments in Other Fields

Pig-Iron Production Is 3,213,091 Tons in March

A remarkable recovery in pig-iron production is shown by the statistics for March gathered by wire from 344 blast furnaces. The total was 3,213,091 tons, or 103,648 tons a day, as against 2,319,399 tons in the 28 days of February, or 82,835 tons a day. As coke supply has increased, more furnaces have wheeled into line, the net gain in the month being 24. The 344 coke iron furnaces in blast April 1 were producing at the rate of about 106,500 tons a day, as compared with an actual average production of coke iron in the year 1917 of 105,000 tons a day.

Three new modern blast furnaces were put in operation last month, one by the Lackawanna Steel Co. at Buffalo, one by the Steel Corporation at Gary, Ind., and one by the Iroquois Furnace Co. at South Chicago. These additions emphasize the tendency to give the larger furnaces a full supply of coke, while that of smaller stacks is more or less irregular. Further indication of the same policy is the fact that the steel companies' rate of pig-iron output in March was 30 per cent greater than in February, while that of merchant furnaces was only 12 per cent greater.

The fact that pig-iron production has increased so quickly in the favorable weather of March points to a relaxing of famine conditions in that market sooner than has been thought possible.

Government wants figure so largely that ordinary consumption has become quite incidental. The pending award of 100,000 cars, of which about half will be box cars, is the immediate market feature. A total of 1,000,000 tons of plates and 250,000 tons of shapes is now the estimate on these orders, but deliveries will be distributed over many weeks.—*Iron Age.*

Aviation Situation Little Changed

(*Continued from page* 669)

perior to the Liberty engine and will therefore be employed in very high-class fighting machines as a preferential engine.

"We are engaged in quantity production, a production that when under way will mean that vast quantities of these engines will be turned out by machinery. The tooling, the finishing, practically everything is done by machinery. The English make their motor for the highest class of fighting machine almost entirely by hand. It requires infinite labor and fitting and time, and there are only a limited number of men capable of that particular class of work. In time we will perhaps reach a point even better than the engines that are now being made in any country. But understand, this engine had to be designed, it had to be built, it had to be worked out in the factories, and we started in on the plan of quantity production. I think I can say that while we have been delayed and have not made as much headway as we hoped, many of the delays which have come were unavoidable. There were a thousand changes, first and last, made in this engine, most of them trifling. There have been some delays, and I say to you frankly I believe that one great trouble has been in the War and Navy Departments, for it has not been the Aircraft Board that has had the construction of these machines. It has been the War and Navy Departments, and I think there are delays there. I think there can be reforms there that will be of great benefit."

Uncertainties in Coal Industry Cleared Away

The National Fuel Administration is making rapid strides in the work of clearing away the uncertainties besetting the coal industry. A zoning policy has been announced; new price regulations have gone into effect; jobbers are practically unhampered in their methods of doing business; local fuel administrations in the different states have been organized to take charge of distribution.

Now the cry is for production. Stocks are down to rock bottom, although record tonnages are being produced at some mines. With the added demand that will surely come from household consumers during the next few months there arises the question, "Will the output equal the requirements?" It is hard to see how this can be answered in the affirmative, though it is a bit too soon to be pessimistic. Just at present, however, the number of cars handled at the loading piers shows an improvement that under ordinary conditions would be sufficient to create a surplus, but which now indicate that the demand is more than keeping pace with the supply. Dealers are accepting orders subject to Fuel Administration regulations, though no contracting is reported for the smaller coals.

The market showed signs of activity during the past week, though the trade is still a little uncertain due to the fact that the making of contracts is confounded by Government commandeering and preferential shipment orders. The zone system is also adding complexities. There is some talk of the Government canceling all contracts for coal which did not expire on April 1.—*Coal Age.*

War Truck Driver Qualifications

(*Continued from page* 675)

lights. In addition to this the officers have to be acquainted with an approved system of maintenance, so as to know how and where to requisition spare parts. This is not the simple matter it appears at first sight. In the first place it is necessary to know how to describe the part wanted; the officer must know what number he is entitled to keep in stock; he must know where every single part he receives is made use of, and he must know how many parts he has in stock.

An examination of numbers of requisition orders shows that some officers do not have any clear notion of how to order parts. Among the most unforgivable requisitions were twelve fan belts, without indication of type of car; one roll of brake lining for Fiat cars (model not stated, and fact evidently ignored that Fiat used nothing but cast iron liners); six magnetos (make and type not given); pair of gear wheels for gearbox.

Given a good officer and practically all the difficulties are removed, for even if the men are untrained or of limited experience not many weeks will elapse before he has transformed them into capable drivers. With an untechnical, inexperienced or unmethodical officer not only is the efficiency of the entire column lowered, but its operating cost will go up at an amazing rate. There is more scope for the display of technical knowledge, skill, and intelligence in the automobile service of the army than in the infantry or the artillery. There is no branch of the service which can be made so costly to the nation, if officers are not experienced and properly trained, as the motor service. An inexperienced infantry officer will cause needless loss of life; an inefficient motor transport officer will be hardly less responsible for loss of life, and at the same time lose costly material.

It is not necessary that the automobile officer should be a highly trained engineer, but it is important that every officer entering any branch of the service in which motor vehicles are to be used should go through a special course of training before taking up his commission. There are thousands of men in America with good automobile experience, capable of running a garage, of carrying out repair work, etc.; but the number is infinitely small of men who have had the special experience required to successfully operate trucks and cars on war service. The few weeks lost in imparting this necessary instruction to future officers will be more than repaid by the resulting efficiency of the service.

Men of the Industry

Changes in Personnel and Position

MacDonald Made Head of Naval Aircraft Factory

K. B. MacDonald, formerly vice-president of the Curtiss Aeroplane & Motors Corp., Buffalo, has been commissioned a lieutenant-commander of the United States Navy, and placed in charge of the naval aircraft factory at League Island Yard, Philadelphia.

—

H. W. Goewey has resigned as advertising manager of the Saxon Motor Car Co. and has joined the Trussed Concrete Steel Co., Youngstown, Ohio. Carl M. Green Co. will handle Saxon advertising.

—

E. H. Shepard has been appointed manager of the Detroit branch of the Stromberg Motor Devices Co., succeeding George H. Hunt. Mr. Shepard has been sales engineer for the Stromberg company in Detroit for the last 5 years.

—

W. O. Duntley has resigned from the presidency of the Chicago Pneumatic Tool Co., Chicago, manufacturer of the Little Giant truck. He stated that he had retired from active management so as to be able to devote more time to private business. His successor has not been named.

—

H. M. Adams has been appointed eastern district manager of the Willard Storage Battery Co., Cleveland, to succeed A. W. Sayer, who has been recalled to the main office. Mr. Adams will have headquarters in New York.

—

C. E. Williams, formerly assistant sales manager of the Velie Motors Corp., has become associated with the Selden Truck Sales Co., Rochester, N. Y., in the same capacity.

—

Cassius F. Baker has been appointed supervisor of agencies of the Templar Motors Corp., Cleveland.

—

Henry T. Myers, for 3 years sales manager of the truck division of the Studebaker Corp. of America, Detroit, has returned to Boston as branch manager of the Boston territory, to succeed George N. Gordon. Myers occupied this position before he went to Detroit. He will continue as manager of commercial car sales.

—

J. P. Vane has been appointed Western district manager of the Olympian Motors Co., Pontiac. He will have headquarters in San Francisco.

—

I. K. Schnaitter, formerly credit manager of the Willard Storage Battery Co., Cleveland, has been appointed assistant secretary and treasurer of the company.

—

Charles L. McNulty has resigned as district sales manager of the Saxon Motor Car Co. and has joined the Oklahoma Truck Corp., Oklahoma City, Bethlehem truck distributer, as secretary, treasurer and general manager. This new organization will distribute Bethlehem trucks throughout the State of Oklahoma and in the Wichita, Kan., territory, with a branch house at Wichita.

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H. W. DeWees, formerly purchasing agent of the Saxon Motor Car Co., has joined the Trussed Concrete Steel Co., Youngstown, Ohio.

—

E. R. Greer, assistant superintendent of the Emerson-Brantingham Implement Co., Minneapolis, has obtained a year's leave of absence to work on the government trucks manufactured by the Four-Wheel-Drive Auto Co., Clintonville, Wis. Mr. Greer has been in tractor engineering work for many years, and during the past year has been chairman of the Minneapolis Section of the Society of Automotive Engineers.

—

George L. Moscovicz, who has been doing special work for the Mitchell Motors Co. for some time, has been made advertising manager, succeeding F. K. A. Kapp, who resigned.

—

L. A. Kellar has been appointed manager of the Studebaker branch in Chicago. He has spent several years in the service of the company at the Omaha, Portland and Los Angeles branches.

—

H. Montgomery has been appointed purchasing agent for the munitions department of the Harroun Motors Corp., Wayne, Mich.

—

T. S. Gamble, formerly advertising manager of the Maxwell Motor Sales Corp., Detroit, has been appointed a lieutenant in the aviation section of the army. He is now at the Ohio State University at Columbus.

—

W. L. Agnew, formerly advertising manager of the Chalmers Motor Co., has been placed in charge of the wholesale department of Liberty cars at Savannah.

—

Charles A. Clark has been appointed district sales manager of the Acason Motor Truck Co., and will have charge of eastern territory, with headquarters in Boston. He was for some time connected with the Knox Tractor Co. and more recently with the Gramm-Bernstein Co.

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Stephen D'Orlow has been appointed research engineer of the Republic Motor Truck Co., Alma, Mich. He was formerly chief engineer of the Oak Mfg. Co.

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W. E. Dunston, formerly chief engineer of the Standard Parts Co., has joined the Crown Hardware Mfg. Co., Dayton, Ohio.

New Companies Formed

Latest additions to ranks of Automotive Industries

Preston Passenger Car Being Made in Alabama

BIRMINGHAM, ALA., March 29—Within 60 days the Preston Motor Car Co., organized in Birmingham and financed largely by Alabama, Mississippi and Florida capitalists, will begin the manufacture of light cars and ¾-ton trucks in this city. Inside of twelve months, according to officers of the company, it will be giving employment to between 4000 and 5000 skilled laborers. A 7-acre tract, formerly the property of the Birmingham Boiler Works, has just been acquired by the company for $30,000. The offices of the plant will be at 1015 Fortieth Street, Birmingham. Adjoining the factory site is ample acreage for expansion.

Parts of the first Preston car are now being manufactured at the plant of the Sandusky Forging Co., Sandusky, Ohio, but the first car will not be put together until the Birmingham plant has been made ready for its assemblage.

The passenger car, which was designed by W. H. Tarpley of Newark, N. J., will sell for $600 f.o.b. Birmingham. The truck will sell for $1,000.

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Vollbrecht and Bradfield Form Company

DETROIT, March 25—F. A. Vollbrecht and H. C. Bradfield have formed the Bradfield Co., an advertising and sales promotion organization. Vollbrecht was formerly general manager of the King Motor Car Co., and Bradfield has done sales promotion work for the King and Cole companies.

—

Company Allied with Field Motor

BOYNE CITY, MICH., April 1—A company is being organized here, closely allied to the Field Motor Co., Grand Rapids. It will manufacture engines under the Field patents. The engines are for farm and tractor service and are made in only two sizes, 20 and 30 hp. The company expects to be turning out 100 of the large engines a month and possibly 50 of the smaller size very shortly.

—

Shaw Assn. Buys Field Motor Stock

GRAND RAPIDS, March 30—The stock of the Field Motor Co. has been purchased by the Shaw Assn., Ltd., of Chicago, and the company now has sufficient capital for expansion and the filling of orders. The board of directors has been changed and consists of E. A. Field, president; Byron E. Parks, vice-president; C. G. Saunders, secretary; W. A. Papworth, treasurer, and W. S. Shaw.

Doble-Detroit Company Buys General Engineering

DETROIT, March 30—The Doble-Detroit Steam Motor Co. has purchased the assets of the General Engineering Co., former owner of the Doble patents. The company will issue $1,500,000 of stock to five voting trustees, who will issue one voting trust certificate for the same amount to the General Engineering Co.

The voting trust certificate which, by agreement, will not be divided until a future date, will be in full payment for all the patents, rights, good will and assets of the General Engineering Co.

Two of the voting trustees will represent the General Engineering Co. and three the Doble-Detroit Steam Motor Co. The former company will, in time, be dissolved. No royalties are to be paid by the Doble company for either patents or licenses.

The company has advanced its production plans. Deliveries of standard cars, now in process of manufacture, will start in April, during which month 50 cars will be shipped. Production will increase until full capacity has been reached. The average monthly output will be 1000 trucks.

The added directors of the company are: Kirk B. Alexander, who has also been made vice-president; William J. Fisher, Harrington E. Walker and Harold C. Johnson. Other directors will be added until the full membership of fifteen has been reached.

—

3,913,297 Hayes Wheels in 1917

JACKSON, MICH., March 28—During 1917 the Hayes Wheel Co. manufactured 3,913,297 wheels, which is an increase of more than 1,000,000 wheels over the 1916 production of 2,732,264.

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Shelby Trucks and Tractors in Production

SHELBY, OHIO, April 1—The Standard Mfg. Co. is now styled the Shelby Tractor & Truck Co. and has started production of a ¾-ton truck and a two-plow tractor. The company has been experimenting and developing these models for two years.

—

Making New Fedders Radiator

BUFFALO, N. Y., April 1—The Fedders Mfg. Co. has started production on a new model of tubular radiator with cast iron or pressed steel shells and cores of seamless tubes having spiral fins. The top, bottom and sides can be unbolted and removed, thus exposing the tubes when it is necessary to replace any damaged parts.

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"Waterloo Boy" Company Bought by Deere

WATERLOO, IOWA, April 1—The Waterloo Gasoline Engine Co. has been purchased by Deere & Co., Moline, Ill., for a consideration of about $2,000,000. L. W. Witrey, vice-president and superintendent, and J. E. Johnson, secretary and treasurer of the old company, will continue to direct the business of the gasoline engine and tractor plant.

The Waterloo company was established in 1885 for the manufacture of gasoline engines. About 4 years ago the company started production of the Waterloo Boy. By the purchase of this business Deere & Co. will enter the tractor field.

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Current News of Factories

Notes of New Plants—Old Ones Enlarged

Highway Trailers for Army

EDGERTON, WIS., April 1 — The Highway Trailer Co. has received a government contract for about $450,000 worth of 5, 10 and 15-ton trailers for the United States Army. The company has started the manufacture of a new type of airplane trailer, invented by its president, James W. Menhall.

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Willys-Overland Distributing Plant Leased

SANDUSKY, OHIO, March 30—The Willys-Overland Co. has leased a building here as a distributing and shipping plant. The plan is to drive the cars from the Toledo factory to this building and then either ship them to other points or drive them away. The plan has been adopted as a result of poor transportation facilities in Toledo.

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Racine Tire in New Plant

RACINE, WIS., April 1—The Racine Auto Tire Co. has moved to new quarters. Equipment has been added and the capital increased to $500,000.

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Harley-Davidson Addition

MILWAUKEE, March 31—Work is well under way on an addition to the Harley-Davidson plant. This will be two-stories high, 120 x 180 ft., and of reinforced concrete, steel and brick construction.

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Dividends Declared

The Chicago Pneumatic Tool Co. has declared a quarterly dividend of 1½ per cent on common stock, payable April 25 to stock of record April 15. This is an increase of 1 per cent over the previous payment.

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The Pierce-Arrow Motor Car Co. has declared the regular quarterly dividend of $1.25 a share on the common stock, payable May 1 to stock of record April 15.

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Increase of Capital

DETROIT, March 26—The King Motor Car Co. has increased its capital stock from $200,000 to $700,000.

Paige-Detroit to Make Complete Line of Trucks

DETROIT, March 30—The Paige-Detroit Motor Car Co. will manufacture a complete line of Paige trucks, ranging from 1 to 5 tons in capacity. A separate truck department is being organized, and a complete truck factory equipped, including several buildings in addition to those in the Paige group.

The new truck plant will be distinct from the passenger car factory, but the product will bear the Paige name, and be exclusively and completely a Paige product.

The decision to manufacture Paige trucks was reached after the company had studied the motor hauling situation, and made an exclusive investigation of the problems involved.

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Franklin Production Increases 235 Per Cent

SYRACUSE, N. Y., March 28—The H. H. Franklin Mfg. Co. reports an increase of 235 per cent in production during 1917 over 1916. Last year the company manufactured 9000 cars as compared with 3800 in 1916.

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Studebaker to Make 150 Cars a Day

DETROIT, March 30—The Studebaker Corp. has started quantity production of its new models. More than 1000 have already been manufactured and shipped, and are being turned out at the rate of 40 cars a day. This will be increased to 100 a day in 3 weeks and 150 a day in 6 weeks.

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Signal Truck Declines Paige Offer

DETROIT, March 28 — The Signal Motor Truck Co. has declined the offer of the Paige-Detroit Motor Car Co. to purchase its plant and assets. The sum of $100,000 will be immediately available with which to carry on the business of the Signal and increase its production schedule.

It is planned to make 1200 to 1500 during 1918. Stockholders have agreed to decrease the par value of their stock from $10 to $5, and each stockholder will be entitled to one share so reduced in par value for each share now held. A local stock broker will give credit for the amount required to carry on the business.

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Change in Control of Smith Motor Truck

CHICAGO, March 30—Rumors of the purchase of a dominant interest of the Smith Motor Truck Corp. by a syndicate of New York and Boston capitalists have been verified by R. I. Eads, vice-president of the company. The names of the purchasers are withheld. Arrangements have been made for additional capital, the amount to be determined by an investigation of the present condition of the company. A statement will be issued shortly and, according to Mr. Eads, this will show a great reduction in the liabilities and the good financial condition of the company.

The change in control will result in the election of a new board of directors. The company will move shortly to new quarters at Wabash Avenue and Congress Street. The retail branch will be discontinued and new arrangements made for covering local trade.

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Lecture on Non-Essential Industries

CHICAGO, March 30 — Julian B. Arnold, of the British War Mission, delivered at the civic industrial meeting of the Chicago Assn. of Commerce yesterday an address on "What Is a Non-Essential in War Time." Mr. Arnold cited instances where several large British concerns making non-essentials had divided their plants to devote 50 per cent of their energies towards munition production. In one case a large jewelry factory devoted half of its talent to making some of the small detail work on shells, etc. A piano company partitioned off its plant and the men used to handling wire and fine woods are making airplane parts. Such companies, he said, when the war is over would gradually force out the war industry half and assume full production of their regular line.

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Mail Flights Before May 15

WASHINGTON, March 30—Airplane mail service between Washington and New York will be inaugurated before May 15. The selection of a landing site in New York is the only obstacle. A landing place has been located in North Philadelphia about 25 minutes by motor truck to the central post office. The tract chosen comprises 157 acres. Work of erecting hangars will begin at once. The War Department has everything in readiness to supply the Post Office Department in so far as machines and fliers are concerned. It is expected that the North Philadelphia site will allow a further reduction in flying time of 25 minutes. It is far from the tall buildings of the city and allows low flying both on arrival and departure. Six airplanes will be used for regular trips with at least 3 others in reserve. Each machine will carry 300 lbs. of first class mail.

Good Weather Helps Drive-aways

Even Ordinary Mud Roads Are Passable—Cost Less Than Freight Transportation

DETROIT, April 1 — More settled weather conditions have improved the roads, and great droves of dealers are coming here to drive cars away. Even the ordinary mud roads are in good shape, and this improved condition has decreased the cost of drive-aways.

The Hupp Motor Car Corp. reports that the expense of driving 20 cars to St. Louis was less than the freight cost of $34 a car. The trip was completed in 2 days. The Hupp company sent overland a total of 150 cars last week.

Paige-Detroit Averages 40 Cars Daily

The Paige-Detroit Motor Car Co. drive-aways average 40 cars daily. Forty-five of these went to one distributer in Birmingham, Ala., 28 started for Rutledge, Ga., and 10 were taken by a Des Moines distributer. The average distance of the drive-aways last week was 300 miles.

Exclusive of government trucks Packard is driving away the company sent overland since December 12½ per cent of its passenger car production and 21 per cent of its truck output.

Reo Drive-aways Increasing

The drive-aways of the Reo Motor Car Co. are increasing steadily. Where 8 per cent of the company's production was driven away 3 weeks ago the percentage now is 28 per cent. A train of 26 speed wagons bound for Atlanta, together with 10 speed wagons and passenger cars for Charleston, were piloted by a Cincinnati dealer as far as his city. He was also taking 4 cars for himself.

Dodge Brothers drove away 1500 cars last week Fully 50 per cent of these go to points within a 300-mile radius. Many dealers, mainly in New York, Boston and other Eastern cities, are maintaining three teams of five men each to go from their cities to the Dodge drive-away garage. While one team is leaving here another is arriving at its destination and the third is on the way back.

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Vulcanizing Machines for Shoe Repairing

WARREN, OHIO, April 1 — The Arthur Vulcanizing Machine Co. has received a government order from the War Department for vulcanizing machines to be used in the repair of rubber footwear. A separate shop in the salvage plant of the American expeditionary forces in France has been established and vulcanizers are being installed. This work is being carried on under the supervision of Paul B. Masters, secretary and treasurer of the Arthur company. The method used is the same as that for repairing tires and tubes and the materials are the same. Half soles, heels and patches are put on.

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Will Regulate Women Workers

WASHINGTON, March 27—Industrial conditions for women during the war were discussed by representatives of the woman's committee of the National Council of Defense who assembled here yesterday from 14 states. Plans were reported to so organize the women of the nation as to make them available from now on for any emergency which may arise. In this connection registration and classification of female labor were discussed. Reports from many states display a present lack of co-operation, and as a result of the conference it is planned to index the industrial ability of all women workers in their respective districts. The Department of Labor is preparing a questionnaire that will classify the women into the proper divisions.

Captain George W. Carr of the Ordnance Department told that steps had been taken by this division to safeguard women workers in munitions plants and that standards have been fixed regulating hours of work, wages and so forth. General opinion was expressed in favor of an 8-hr. day for women workers with avoidance of night work as protection morally and physically.

Calendar

ASSOCIATIONS

April 15-19—Little Rock, Ark., United States Good Roads Assn. Sixth Annual Session.
June 5-12—Hot Springs, Va., National Assn. Automobile & Accessory Jobbers.
June 17-19—Dayton, O., Society Automotive Engineers, Annual Midsummer Session.

SHOWS

Mar. 25-30—Rochester, N. Y., Tenth Annual. Rochester Auto. Trades Assn., Exposition Park. C. A. Simmons, Mgr.
Mar. 25-30—Bridgeport, Conn., Fourth Regiment Conn. Home Guard State Armory and Casino. B. B. Steiber, Mgr.
Mar. 27-29—Fort Fairfield, Me., Reed's Garage. R. F. Reed, Mgr.
Mar. 30-April 6—Hartford, Conn., Eleventh Annual, Hartford Automobile Dealers' Assn., Inc. State Armory. B. F. Smith, Mgr.
Mar. 30-Apr. 6—Atlantic City, N. J., Second Annual, Garden Pier. S. W. Megill, Mgr.
Mar. 30-Apr. 6—Chicago, Ill., Second Annual Chicago Used Show. Chicago Auto. Trade Assn. Coliseum.
Apr. 1-6—York, Pa., York Auto Dealers' Assn. T. F. Felffer, Mgr.
April 3-6—Battle Creek, Mich., Second Annual. W. A. Donaldson, Mgr.
April 3-6—Ogdensburg, N. Y. Second Annual, State Armory.
April 6-13—Green Bay, Wis. Brown County Automobile Trade Assn.
April 6-13—Red Bank, N. J., Monmouth County Auto. Dealers' Assn., Armory, E. C. Von Kattengell, Mgr.
April 8-13—Reading, Pa., Reading Auto Trade Assn.
April 9-13—Stockton, Cal., Third Annual San Joaquin Auto Trade Assn. Samuel S. Cohn, Mgr.
April 16-20—Deadwood, S. D. City Auditorium.
April 17-19—Davis, Cal., Tractor Demonstration. University of California.
April 17-20—Calumet, Mich., Upper Peninsular Show, Copper County Automobile Dealers & Garage Owners' Assn., Coliseum.
May 3-7—Lima, Ohio, Ohio State Automobile Assn.
Sept. 23-28—Chicago, National Accessory Show for Fords, Coliseum.

ENGINEERING

June 26-28 — Buffalo, N. Y. American Society of Heating and Ventilating Engineers.
Sept. 2 — Cripple Creek, Colo. American Institute of Mining Engineers.